UNIVERSITY OF NEW ENGLAND

THE DEPICTION OF ENVIRONMENT THROUGH ART

The role of exhibited environmental art in public engagement with environmental sustainability: A case study of the Bimblebox art-science-nature exhibition

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Certification

I certify that I am the sole author of this work and that the research ideas, data collection, findings, discussion and conclusions set out in this thesis are entirely my own effort except where otherwise stated. I also certify that the work is original, has not been previously submitted for any other degree; and any help received in preparing the thesis, and all sources used, have been acknowledged within the text.

22/07/2018

Signature of Candidate Date

ABSTRACT

This research set out to further validate and extend a sparse academic literature: on the capacity of art advocacy to influence pro-environmental behaviour and sustainability adoption in the audiences for exhibited environmental art. It was also developed to further validate the use of art to help close an environmental attitudes-action gap: that limiting divergence between citizen and community held pro-environmental motivation and intention; and the subsequent pro-environmental behaviour they undertake. A mixed method survey design was applied within a case study of audience response to an Australian environmental art exhibition. The Bimblebox: art-science-nature exhibition was seen by over 45,500 people during its national tour between 2014 and 2017. A purposive sample of research participants (N=79) drawn from the exhibition audience was used to further validate the existence of several theoretical components of environmental art influence. Findings revealed that over half of participants who answered a survey within two months of seeing the exhibition stated future pro-environmental intentions linked to their art experience; and that frequency rose slightly for those who answered the survey 12 months after seeing the exhibition. This latter response also included examples of specific pro-environmental behaviours performed. Additionally, participant response to the software app designed for exhibition art presentation was combined with literature review of emerging digital technologies and international museum practice. The response of a cohort of Australian environmental art and museum practitioners to these published findings was also obtained. Jointly, these data sources helped reconfirm the value of environmental art advocacy as an important resource in public sustainability engagement. The research concluded that this resource could probably be further enhanced by a more systematic intersection of environmental art advocacy, its presentation in museum spaces using digital technology; and the better integration of this intersection with other, public, capacity building initiatives such as environmental art-science collaboration and education for sustainable development.

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Preamble

It is late 1960s Britain. A teenager sits in a small, darkened suburban lounge room watching an equally small black and white television set. On screen is a wildlife film about the Amazon rainforest. Grainy, but nevertheless for the time, compelling images of toucans, monkeys, tarantulas and three-toed sloths move across the screen – and then there are scenes of rainforest trees being felled with a chain saw. Smoke wisps up from between charred stumps dotting a hillside leading down to a river. A short piece of unremembered narration and the credits are rolling.

This scene now dissolves into another. Another television set, much bigger this time, with the same viewer now on the other side of the world, and with nearly half a century elapsed. Another wildlife film is playing; this time in high resolution with vivid colour, on the subject of the Great Barrier Reef. The narration mixes environmental science concepts, ecological understanding and an almost reverential appreciation of the beauty of the Reef – but then informs us that this could all be gone well within a human lifespan.

Stepping out of the frame of memory and reflection, I was that teenager of earlier times and I am the author of the thesis to follow. It surprises me now as I write this preamble in 2017, that I can still remember the visceral shock – the strength of the negative emotional impact that watching televised imagery of environmental destruction had on me as a 14-year-old. It clearly still does many decades later; and I now recognise that the photojournalism and cinematography contained within both films, although different in their technical competence and objectives, are forms of environmental art; a central subject of the research described in this thesis.

Linked to the almost half century which separates these two anecdotes of environmental television memory and their personal, cognitive and emotional influence, I am aware of aprofound paradox. Now, as then, I can watch representations of the natural world, albeit in ever greater fidelity and acuity of vision, whilst many of those same environments are disappearing

in the early twenty-first century at an accelerating rate. They are being destroyed through a mixture of ecological ignorance, economic greed; outmoded values and narratives of progress; and the distorting effects of cognitive biases on our behaviour and actions, which are inherent in the evolutionary biology of the human brain.

With considerable sadness, I have come to understand that my own lifespan closely co-incides with what is now being described as the Great Acceleration period of the Anthropocene era: the time of humans. This is a time in which the levels of destructive human impact on the natural world have reached the level of a geological force; with far reaching implications for the future wellbeing of both environmental and human social systems.

Undaunted, I shall continue to watch environment-oriented television during the Anthropocene. Personally, and anecdotally the power of the television documentary to raise awareness and spur people to action for the sake of the natural world remains self-evident to me. It is perhaps fitting, therefore, that I now find myself undertaking academic research into the capacity of another art form – environmental exhibition art – to achieve the same outcome.

For this latter art genre, however, I am not basing my conclusions on the influence of environmental art entirely on subjective opinion and untested, informal hypotheses. Rather, I am bringing the greater objectivity of a social scientific lens to bear on the matter of whether environmental exhibition art can make even a small contribution to an urgently needed transition. A key question for us all now is whether global society can develop a much more realistic, respectful and stewarding relationship with the natural world upon which it absolutely depends – and whether it can do it quickly enough to avoid a future of unimaginable stress and hardship for the generations of humans and other species to follow. The following thesis, encapsulating my research, is my small contribution to addressing these questions.

CHAPTER 1: Introduction

Over the last decade the public communicative, educative and capacity building potential of diverse forms of environmental art advocacy has received increasing academic interest and investigation (e.g., Brown, 2014; Curtis, 2007; Curtis et al., 2014; Kagan, 2008; Marks, 2015). The public engagement roles for environmental art, and its potential to motivate the public toward greater levels of practical action regarding accelerating environmental problems and impacts, has been a central interest of this present research. My work set out to further validate, and extend the (currently sparse) academic literature exploring the influence of environmental art on pro-environmental behaviour; and the capacity of such art to assist in triple bottom line (TBL)[1] sustainability adoption by the audiences who interact with it.

Extending well beyond its corporate origins, triple bottom line sustainability as an organising idea has evolved to become highly influential on other conceptions of sustainability practice. A good example of this influence lies within the contemporary aspiration to integrate the needs of 'people, planet and prosperity' within United Nations strategic documentation on the promotion of global sustainable development; as in the 2030 Agenda for Sustainable Development and the associated Sustainable Development Goals (United Nations, 2017). In other reworking of the original framework, a fourth, cultural bottom line has also now been added with particular relevance to the arts. An example of this approach is provided by the 'culture 21' or 'Agenda 21 for culture' initiative which, inter alia, seeks to more closely align cultural policies with sustainable development (Pascual,2016).Unless otherwise stated, all further use of the term 'sustainable' or 'sustainability' in this thesis refers to an underpinning TBL concept, with

[1] The triple bottom line sustainability concept (TBL) originated in the 1990s as a corporate methodology to report business impact 'bottom lines' across a social and environmental, as well as a purely economic balance sheet (Global Reporting Initiative, 2017)

its implication of progress toward a more closely integrated form of social, environmental and economic progress.[2]

My research was also a response to the urgent and well recognised problem of the so- called environmental attitudes-action gap a divergence between citizen and community held levels of pro-environmental motivation and intention, and the subsequent level of pro-environmental behaviour undertaken by those same individuals and groups[3] (Kennedy et al.,2009). According to Howes, this has been driven, in part, by an inability to communicate sustainability objectives to key stakeholders effectively (Howes et al., 2017). Such a critique has also resonated with past calls for more compelling ways to communicate, educate, engage and empower individuals and communities globally on scientific and technological issues. (Nisbet & Scheufele, 2009; Saylan & Blumstein, 2011; Harris, 2015).

Against this background, environmental art advocacy, a generic term applicable to a wide range of artistic practices that seek to enhance human relationships with the natural world (Bower, 2012) has been increasingly suggested as one important 'novel' resource to aid public triple bottom line sustainability engagement objectives; and to help close the environmental attitudes-action gap by motivating more pro-environmental intentions and behaviour in individuals and communities (Boulton, 2016; Latour 2016; Shaw & Corner, 2017).

Accordingly, this project was centred on a case study of a travelling, Australian environmental art advocacy exhibition and public audience response to it. The Bimblebox: art- science-nature exhibition was seen by a combined audience of over 45,500 people during its national tour between 2014 and 2017. One of the key objectives

[2] The 2030 Agenda makes explicit reference to the 'economic (prosperity), social (people), and environmental (planet) dimensions of sustainable development.'
[3] A recent Australian example of the environmental attitudes-action gap is provided in Section 1.1

of the exhibition was to bring public attention to the biodiversity and conservation values of an important Australian nature refuge threatened with destruction by so-called ‘mega’ coal mining development proposals. The exhibition is described in detail in Chapter 2.

The three key research questions posed in this study, described more fully in Section 3.1.3, were formulated with two main objectives. The first was to search for any theoretical mechanisms or components of environmental art influence observed to be operating on the pro- environmental behaviour of a research sample recruited from the Bimblebox exhibition audience. A second objective was to extend research into the capacity of environmental art advocacy to engage the public with sustainability issues, using the leverage from a proposed ‘sustainability intersection.’ The benefits of a closer intersection between art, science and technology has long been discussed, in general terms, in the literature (Wilson, 2003). In turn, the antecedents of this discourse go back at least as far as the late 1950’s (Snow, 1959). What I am envisaging here, however, is a closer engagement between environmental art and science collaboration, enhanced community engagement practices within the museum and gallery sector; and a still emerging spectrum of digital technologies which hold great promise for presenting art practice in more compelling and engaging ways to the public. It appeared to me when commencing this thesis that this intersection could become an increasingly important means for the public to engage with environmental art.

I now turn to a more detailed description of the core research problem of the environmental attitudes action-gap, and give a review of the literature which helped shape the intended contributions of this research; including the contribution that environmental art advocacy can make to close the attitude-action gap. The overall structure of the thesis is given in Section 1.6.

1.1 The Problem of the Environmental Attitudes-Action Gap

This research was undertaken as a direct response to the manifest disconnect between what we know, scientifically, needs to be done to halt and start to reverse global environmental deterioration; and the inadequate response to this global challenge that has occurred to date (Wright & Nyberg, 2014). In the academic literature, the divergence between an individual's environmental beliefs, attitudes, and personal narratives, and the subsequent, pro- environmental behaviours undertaken by those same individuals, has been termed the 'environmental attitudes-action gap' or 'environmental values-action gap' with the term 'attitudes-action gap' used to describe this concept throughout the remainder of this work (Lane & Potter, 2007; Kennedy et al., 2009; Newton & Meyer, 2013). The presence of the attitudes-action gap at various levels of society has been well recognized as a serious impediment to public and political engagement toward more ecologically sustainable modes of development (e.g., Shellenberger & Nordhaus, 2009; Whitmarsh et al., 2011)

In the past, traditional forms of public environmental science communication and education about environmental problem impacts and risks were seen to be a big part of the answer to closing the attitudes-action gap. An early vision in this tradition anticipated the creation of an environmentally literate stewardship culture amongst pro-active citizens, who would play an assertive and practical role in addressing environmental problems, both locally and globally (UNESCO, 1978). In more recent times, we have come to understand that such forms of community environmental and sustainability engagement, which are now facing far more complex and serious ecological and social challenges, do not seem to have been cutting through to the public realm; at least not sufficiently to bring about an adequate level of effective, pro-environmental and

sustainability response from wider society (e.g., Nisbet & Scheufele, 2009; Saylan & Blumstein, 2011; Howes et al., 2017).

It follows that we need to find different strategies to strengthen existing public response. An example of this difference is the ‘resilience thinking’ approach to environmental management within the newly designated Anthropocene era of accelerating human environmental impacts at a planetary scale (Benson & Craig, 2014). One initial conclusion is that a contemporary scientific understanding of the urgency of the environmental problems facing us needs to be conveyed to the public in a far more compelling, convincing and empowering manner; as do the effective strategies required to address the problems in a realistic time frame.

It is in this context that the public communicative, educative and capacity building potential of diverse forms of environmental art advocacy, for instance, linking to interest in environmental protest, community impacts of nuclear testing and anthropogenic climate change, has been attracting increasing attention (Abrahams, 2017; Bower, 2012; Branagan, 2013; Brown, 2017; Fox, 2015). I move, shortly, to a more detailed consideration of some of these issues and their interplay with environmental art practice as revealed by literature review.

Firstly, I give a vignette of the recent occurrence of the attitudes-action gap problem at a national level in Australia. This recent episode not only pointed to the scale and pace of contemporary, negative environmental impacts, but also typified the socially complex and politically contested sustainability issues within which environmental art practice is situated in the Anthropocene era. I believe this problem also had significant resonance with the environmental art objectives of the case study exhibition in this research.

1.1.1 An Australian example of the attitudes-action gap in 2016

In March 2016 a mass coral bleaching and mortality event, caused by anomalously high ocean temperatures, took place across a wide swath of the Great Barrier Reef off the north- eastern coast of Australia (Hannam, 2016). A 2017 satellite, aerial and marine survey gave a 67% median mortality of coral cover across 700kms of individual reefs surveyed in the northern third of the Great Barrier Reef. This was an area which, formerly, had held the most pristine coral cover (Hughes et al., 2017). This event was part of a pan-global episode of coral bleaching linked directly to the effect of human induced climate change on weather systems, and associated ocean warming. By direct inference the bleaching event also pointed to a causal link with increased fossil fuel combustion globally (Hughes et al., 2017). This recent accelerated loss of coral came on top of a well-acknowledged, long-term trend of decline of coral cover on the Reef overall, which had occurred since the mid-1980s (ARC Centre of Excellence in Coral Reef Studies, 2016; Hughes, Schaffelke and Kerry, 2016).

The clear present and future threat posed to the ecological sustainability of the Great Barrier Reef; the direct connection of the problem to the extreme, human-induced climatic and oceanographic events of 2016, and therefore also to the extent of fossil fuel combustion, occurred against a backdrop of increased national public concern for the wellbeing of this iconic and unique Australian and international landmark. For example, in mid-2016, 63,000 readers of a major Australian media publication were surveyed in the run up to a federal election that year using an online, deliberative democracy tool ‘Your Vote’. The findings indicated that 79% of the survey population expressed strong agreement ‘that the health of the Great Barrier Reef should be prioritised over coal mining.’ (Hasham, 2016). The same newspaper article proposed that the expression of

this public engagement and concern with the issues of the Reef's decline was in contrast to the stated, pro-mining priorities of the two major political parties in the country. The article concluded that the results of this public poll demonstrated how important an issue such as Reef conservation was to many Australians; and that the poll 'suggested that neither major party were as committed as respondents were to prioritising the Reef over coal' (Hasham, 2016).By way of further illustration of this last point, the research period of this study co-incided with ongoing, national and international controversy over the proposed Adani mega coal mine in north Queensland, Australia (West, 2017).This development appeared to have gained either explicit or complicit political support from both sides and all levels of politics in the country, despite polls showing a majority public rejection. Indeed, some of the research participants interviewed in this study make critical comment on this particular mine proposal (see comments A3 08 2017 and A3 09 2017 in Appendix E)

The results of this popular media survey chimes with some other, large-scale academic soundings of Australian public environmental attitudes, for instance with regard to human- induced climate change impacts, and opinions on their remedy from a personal and political perspective (Leviston et al., 2014; Reser et al., 2012). The findings from such work show a consistently high level of public concern with the issues posed by anthropogenic climate change, and an equally high expectation that government and citizens, have an important role to play in addressing the problem.

The contributory ecological and national development factors which would need to be tackled to slow and ultimately reverse the Reef's long-term decline are multilayered, including coastal urban expansion, pollution from both that source and inland agricultural run-off, and overfishing (Day, Grech & Brodie, 2016).The role of increased shipping movements, climate change and ocean acidification, closely

associated with existing and newly proposed Australian fossil fuel extraction and combustion have been largely absent from Government commentary on the problems (Mitchell, 2016 ; Hasham, 2016).They have, however, started to figure in Australian popular, public discourse around the merits of coal and coal seam gas contributions to economic prosperity; and to social and environmental wellbeing within the last few years (Slezak, 2016). I propose that this divide presents a graphic example of the attitude-action gap operating at a national level.

Environmental artistic response to the economic, environmental and social trade-offs which have resulted in ecological damage to the Great Barrier Reef have started to appear. For example, artist Emma Lindsay's *Great Barrier Reef: Anthropocene Project* exhibition in 2017 was described as posing 'a deliberate and critical contrast to dominating media portrayals of wild species...a statement about where society's values lie' (Cultural Flanerie, 2017). Equally, I propose that the case study focus of this work: the Bimblebox: art-science-nature exhibition came to straddle the contradictions of the Great Barrier Reef attitudes-action gap just described.

On the one hand, the Bimblebox exhibition was an artistic response to the proximate environmental threat posed by proposed coal mining development of a supposedly protected, terrestrial nature refuge site; on the other hand, if that site were mined, not only would it destroy its conservation values; it would be the very same coal, wherever burnt on the Earth, that would lead to further exacerbation of the ocean warming and acidification impacts destroying the Barrier Reef in 2016. The 2016 coral bleaching event on the Great Barrier Reef was an example of the attitudes-action gap writ large at the level of the nation state. It was also an example of national environmental policy paralysis; mired in a public-political contest over economic, social and environmental priorities and trade-offs. The thwarted public concern at the lack of

effective national governance on the Barrier Reef problems contributed toward an Anthropocence infused, cultural backdrop to the presentation of the environmental art exhibition studied in this research, and to others described later in the thesis.

I now provide a more detailed consideration of the public sustainability engagement issues described in the introduction and their interplay with environmental art practice as revealed by literature review.

1.2 Literature Review

1.2.1 Environmental impacts in the Anthropocence and some artistic responses

Our inability to gain effective control of serious and accelerating environmental and sustainability problems in the twenty-first century is a current focus of vigorous debate (Wright & Nyberg, 2014; Mastny, 2015; Steffan et al., 2015; Rockström, 2015). The most pressing problems range from anthropogenic climate change impacts (Hannam, 2016) and unprecedented biodiversity loss (Hall, 2016) through ocean acidification and freshwater aquifer reductions; and on to concerns for future social and political instability, driven by these and other adverse environmental trends. Indeed, well established scientific research now asserts that we are living in the Anthropocene era, or age of humans (Gaffney & Steffan, 2017). This is a time in which the scale of human environmental impacts on the planet has accelerated, within the last 60 years or so, to reach the level of geological forces (Steffan et al., 2015; Rockström, 2015).

Paradoxically, in a time of urgently needed local, national and global responses commensurate with the scale of these impacts, it is reported that conventional scientific communication regarding the problems of the Anthropocene is being seriously discounted and marginalised. Rejection of the science of anthropogenic climate change impacts provides a good example of such marginalisation; and this phenomenon appears to be strongly associated with the political orientation and economic worldviews held by

individuals and groups (Lewandowsky et al., 2013). In Australia, Taylor's historical account of the influence of popular media reporting and changing political stance on climate change impacts over the last 30 years or so is illuminating on this subject (Taylor, 2015).Equally, artistic response to these issues has been palpable; with recent art practice starting to incorporate and interrogate the Anthropocene concept, inter alia, as something akin to a metaphor for an age-old duality between humanity both as part of and apart from nature. That is as both steward and exploiter of the natural world (Forum for European Philosophy, 2015; Rae, 2015). This response is perhaps hardly unsurprising given that, across the period of recorded history, various genres of art practice are acknowledged to have reflected and interpreted the important political, philosophical, social and moral issues of their time (Belfiore and Bennet, 2006, 2010).

Surveying the literature of the last 20 years reveals a growing body of research which points to the beneficial engagement of the public with the arts in general. Despite earlier caveats on the methodological limitations of some research (Guetzkow, 2002) a range of beneficial impacts resulting from participation and engagement with the arts has been claimed. These claimed impacts have ranged from a stimulus to community wellbeing and economic prosperity (Mills & Brown, 2004) to the creation of physical and mental health benefits for older adults (Castora-Binkley et al., 2010) The generation of enhanced school experience and educational motivation for students as also been claimed (Geagea et al., 2017).

As has been noted previously the specific public engagement effects of environmental art practice have been less well researched over a similar period, with some notable exceptions (Curtis et al, 2014; Marks, 2017).Notwithstanding this deficit, it may be possible to generate some additional inferences on the potential for public influence of environmental art by drawing on the findings of another, systematically

well-researched area relating to the public engagement effects of art practice in general. I refer here to the community arts and cultural development field (CACD) which I describe in outline in Section 5.4.1.

Environmental art as a genre has reflected the human-environment relationship from its earliest precursors in Palaeolithic cave and rock imagery (O'Hara, 2014). Later, came the mimetic representation of medicinal plants, and then biological specimens, collected during the upsurge of scientific curiosity in the Enlightenment period. In the 19th century, early representations of landscape degradation started to appear in the paintings and photography of that period (Bonyhady, 2003; Grishin, 2013).

Through the twentieth and now into the twenty- first century, environmental art practice has developed new perspectives on the human-nature duality. Present day sustainability concerns in the Anthropocene are underpinned by 'wicked' environmental problems and impacts which are increasingly urgent, socially complex and politically contested (Rae, 2015). And as in the past, art practice has responded to these changes, for example now in the Anthropocene by demonstrating the complex interplay of politics, economics, psychology and aesthetic culture involved in their creation (Davis & Turpin, 2015; Greenfort, 2016).

Generally, across the broad sweep of history, it is claimed, artists have changed from being mainly objective observers, who rendered a depiction of what was observed; to now more often being interventionists, who undertake a practical, physical role in changing, modifying or even remediating the environment observed (Brown, 2014; Fox, 2015).

Within environmental art genres over the last 50 years or so this more interventionist trend has played out, firstly, in forms of monumental Land or Earth Art (Bower, 2012) but also, increasingly from the 1980s onward, in artistic practice that

‘reclaims and remediates damaged environments, restoring ecosystems in artistic and often aesthetic ways’(Hull, 2010). Such remediation work has taken place, for example, in aesthetic crop planting on derelict building sites, or restoring eroded stream banks and beds with public art installations that biodegrade over several years. (Fox, 2015).

As time has progressed, so has the ambition of this form of artistic intervention. A recent example of the scale of such work is the collaboration between the public art consultancy Cape Farewell and the Swansea Tidal Lagoon project in the UK. This project envisages a range of art installation contributions to one of the largest tidal barrage and alternative energy generation schemes ever proposed for the UK (Cape Farewell, 2017).

In Australia, by the 1990s and into the 2000s another interventionist strand; the creation of environmental art that ‘re-envisions our relationship to nature, proposing new ways for us to co-exist with our environment’ (Hull, 2010) was at work. An example of this strand is some arts-based community capacity building projects that aid natural resource management initiatives in river catchment conservation (ANU Engaging Visions, 2016). In the context of the Anthropocene era, the interventionist stance within environmental art could also be considered to reside in its capacity to help make the ‘invisible visible.’ That is an art practice which can present initially complex or imperceptible factors, such as accelerating environmental decline caused by climate change, in such a way as to make it more intelligible to the public (Davis & Turpin 2015; Boulton, 2016). A good example of this capacity is provided by the artistic impressions or visualisations of future climate change scenarios that have been used to better inform the public about likely negative impacts on their communities (Schneider & Nocke, 2014; Corner et al., 2015).

In Australia, it could be argued that an environmental artistic turn toward the Anthropocene concept has been marked by recent major exhibitions that have brought

artistic interpretation of the concept to topics as diverse as overconsumption, social dislocation and new ways of envisaging geological time (Australian National Museum, 2015; Wollongong Art Gallery, 2017; University of Tasmania, 2017). Funding of social science research on the wider cultural implications of the human-environment relationship within the Anthropocene era is also occurring. The project, *Everyday Futures: Australia in the Age of Humans* (Everyday Futures, 2017) 'crowd sourced' photographic art and accompanying didactic text supplied by volunteer members of the public. This allowed the creation of on-line 'place story' vignettes tied to the environmental values and observed changes occurring to places significant to the volunteers. This example of public sustainability engagement through art-oriented outreach resonates with one of the artistic aims of the Bimblebox: art-science-nature exhibition. That aim was to create a place story of the Bimblebox Nature Refuge, its conservation values and the threats posed to them by mining development.

1.2.2 Art advocacy, psychology and socio-political influences

The literature on individual psychological processes, socio-political trends affecting science and the environment, and the capacity of art advocacy to mediate between these elements was influential. A major contribution to the human-environment disconnect of the attitudes-action gap is likely to be a product of our own thought processes. For example, in the form of the mindsets or belief systems we use to interpret and make sense of the world around us (Lertzman, 2012; Weintrobe 2013). The cognitive biases, assumptions and mental narratives we develop as individuals strongly influence and 'frame' our relationship with the natural world, as well as all our other important relationships: social, economic and political, by causing us to favour or prioritise one particular way of interpreting things over another (Lakoff, 2010; Harari, 2014; Nisbet & Newman, 2015). Furthermore, such cognitive processes sometimes lead us to behave in

seemingly contradictory way; and so the story we may carry in our head about our value and care for the environment does not always translate into sufficiently supportive behaviour toward it in practice (Jackson, 2005; Lane & Potter, 2007; Newton & Meyer, 2013).

This disparity seems to have intensified as environmental problems, impacts and risks have become more difficult to comprehend. Though not always immediately visible, they are now 'wicked' more frequent, complex, multilayered and interconnected (Klöckner, 2013; Messling et al., 2015). Some researchers have gone so far as to suggest that the present level of human induced environmental threats, for instance anthropogenic climate change, have attained the level of a conceptual 'hyperobject'. That is, an idea, with its associated implications, which is literally incomprehensible to the general public because of the invisibility, enormity or life-changing seriousness which characterises it (Morton, 2013).

The prospect of a range of incomprehensible ideas about environmental decline poses an obvious and extreme challenge to community scientific communication and public sustainability engagement. Some researchers, however, see an important role for arts practice to play here; even if the environmental perceptions and interpretations of some individuals have a tendency to generate unhelpful hyperobjects in their minds; at odds with the ecological facts of environmental decline. For example, Boulton suggests that we need 60,000 arts practitioners and humanities experts to partner a similar number of natural and social scientists currently working on the problems of implementing transformation toward a more sustainable global society (Boulton, 2016).

At the same time that conventional scientific findings, and suggestions for remedial action with regards to environment problems, fall on many deaf ears, there is

also a reported increase in polarisation of attitudes and actions on the environment at a public-political level (Pidgeon, 2012). This phenomenon of community polarisation has been well represented in Australia recently in the reported dichotomy between majority public sentiment to curtail fossil fuel extraction and export, and government and economic, pro-extractive policy at state and federal level (Queensland Government, 2016 a & b; Hasham, 2016).

A public and political polarisation over conflicting economic and environmental conservation agendas was extremely topical for the Bimblebox art exhibition case study contained in this research. A founding concern for the exhibition was to achieve a good level of public engagement with the environmental issues depicted by its artworks. In turn, this was considered to be more achievable if polarising effects on potential audiences could be avoided. The way in which this principle was applied to the exhibition, and the significant implications for public sustainability engagement through art advocacy, is explored in subsequent sections of the thesis.

1.2.3 Environmental art and the need for critical thinking in a post-truth era

I also became interested in the literature regarding our susceptibility to external influence, for good or ill, through the environmental narratives we hold, and how these can be manipulated. Our views regarding environmental sustainability problems and how they can be best addressed according to robust scientific research are, seemingly, all too easily swayed (Howes et al., 2017). It is claimed that disinformation, false narratives and psychological framing techniques employed by vested interests within the popular media, the fossil fuel industries and their associated lobby groups, can reduce public engagement with sustainability issues and impacts. Counter techniques are being developed to neutralise such influences, and are gaining wider research attention (Maibach et al., 2010; Nisbet & Newman, 2015; van der Linden et al., 2017).Relevant published findings here

concern the role of generic art advocacy, in conjunction with the museum sector, to engage and educate the public on complex or controversial issues in an authentic, non-adversarial and non-polarising manner (Worts, 2016). It is claimed that art may have the ability to not only educate for environmental content knowledge, but also to demonstrate to the public how to think, critically, about human- environment relationships; and in a manner that may yet avoid the risk of public incomprehension of 'hyperobject' sustainability issues such as climate change impacts (Palsson et al., 2013).

1.3 Research Contributions —Public Sustainability Engagement through Exhibited Environmental Art

1.3.1 Validating other studies

All three of the intended research contributions and associated research questions to be described sought to address the problem of the environmental attitudes-action gap. My first intended contribution was to explore the capacity of the Bimblebox: art-science-nature exhibition to engage its audiences with the environmental problems, impacts and risks from coal mining represented within its artworks; and to evaluate, over a 12-month period, the extent of any pro-environmental influence of the environmental messages its artworks embodied. The associated research question framing this intended contribution was put as follows:

- Is it possible to further validate other studies on the influence of art on pro-environmental behaviour?

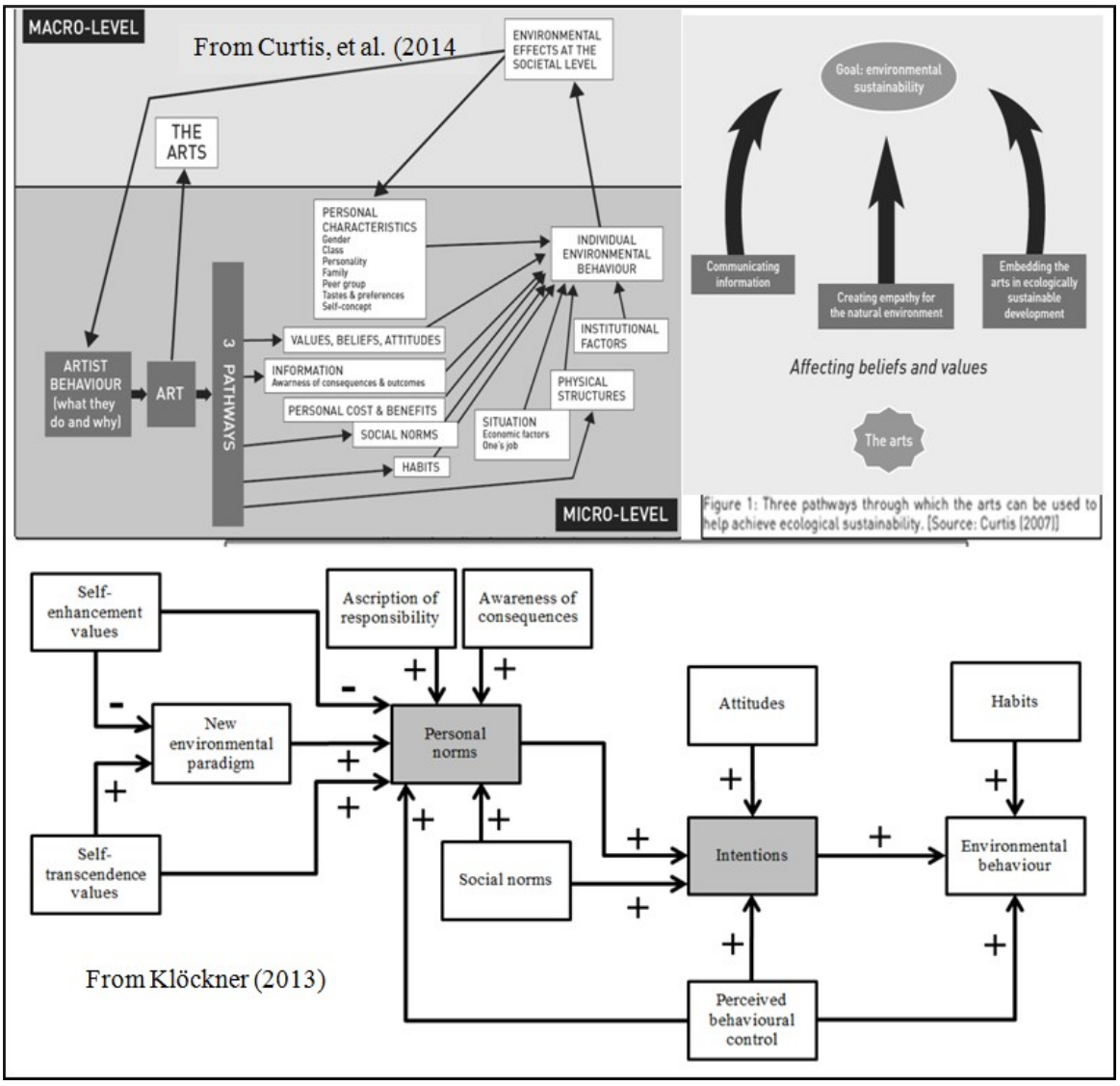
There is a well-established literature describing a wide range of social, psychological, behavioural and situational elements and factors theorised to be involved in pro-environmental behaviour; and a number of theoretical models have been advanced in this field from the 1980s onward. These have become more integrative and meta-analytic over the last 15 years or so (Kollmuss & Agyeman, 2002; Jackson, 2005;

Bamberg & Möser, 2007; Klöckner & Blöbaum, 2010; Klöckner, 2013). There is, however, far less published research that has directly considered the role of environmental art influence, per se, on pro-environmental motivation and behaviour; and even less so in the case of environmental exhibition art. It was toward this gap in the literature that the present study was directed.

A formative paper by Curtis and his colleagues from 2014 was selected for comparison and corroboration purposes within this current research (Curtis, Reid & Reeve, 2014).This study was a synthesis of program findings from previous publications, and hypothesised a number of components and pathways linking various genres of environmental art influence to audience pro-environmental response (see the top panel of Figure 1.1 below). In addition, the present study used psychological determinants of environmentally relevant behaviour proposed by Klöckner in a theoretical model of environmental psychology influence on pro-environmental behaviour (Klöckner, 2013).

That model (see lower panel Figure 1.1) was based upon a meta-analysis of previous theoretical, environmental and behavioural psychology models, and provided a further point of comparison for attempted corroboration and a source of theorising in the present work. More details of how both published studies were used within the present research are given in Section 3.3. Both papers proposed a behavioural model drawn from inferences about the intersecting influence of various social, psychological environmental and economic factors on the environmental behaviour of individuals. Both papers summarised the literature on the psychological determinates of environmental behaviour dating back to the 1980s.The two papers, however, described quite different methods of research approach. The paper by Curtis and colleagues was concerned specifically with the way the arts may shape environmental behaviour at an individual and, by extrapolation, at a societal level. The behavioural model generated

Figure 1.1: Environmental behaviour and psychology models used in this study



from this work used eight case studies of community-based art and environment events dating from the late 1990s to early 2000s.Data were obtained from interviews with 96 key informants working in the arts and in the natural resource management sectors; and from other empirical and experimental studies.

In contrast, Klockner's work proposed a comprehensive action determination model of environmental behaviour based upon an analysis of previous models. This newly evolved model was tested by searching for correlations between proposed model variables and data obtained from a meta-analysis of 97 research articles describing a

diverse range of environmental behaviours including: trends in private car and public transport use; food related behaviour involving meat and organic food consumption and green tourist, and environmental activism behaviours, amongst others. Although differing in their methods and focus, I argue that the two studies produced environmental behaviour models with a considerable degree of overlap of the factors and processes claimed to be influential in underpinning such behaviour. The similarity of these two models, produced from diverse research approaches, gave me greater confidence in selecting some of their common factors for subsequently exploration in my own research.

1.3.2 Engagement through digital distribution of environmental art

The second research contribution involved assessment of the potential for the digital distribution of environmental exhibition art emanating from an emerging spectrum of digital technologies. The digital distribution of art through a purposively designed mobile software application was one feature consciously incorporated into the Bimblebox: art-science-nature exhibition (Harm & Harm, 2016). The widespread public interest in apps as a communication and presentation medium has already been well demonstrated in areas other than art appreciation. In 2013, for example, it was estimated that the Apple Company alone had up to a million different apps available, and had provided 40 billion app downloads up to that point (Carruth, 2014). It is equally clear, however, that quantity does not necessarily equate with quality; with some researchers sounding a note of caution on the validity and educational efficacy of certain apps. For example, in the medical and science education field (Hirsh-Pasek et al., 2015; Davis et al., 2017; Zydney & Warner 2016).

Mobile software applications represent one point on a continuum of interactive digital technologies with significant potential to engage the public with sustainable

development issues. One example is digitally enabled, environmental art practice, or digital eco-art. This genre projects pictorial and audio sound installations onto the natural world with the aim of bringing a new level of public interpretation and aesthetic appreciation toward it (Coles & Pasquier, 2015). Digital applications are also key to the production of artworks that translate ecological data into easy-to-understand images and sound for public engagement purposes in the process of eco-visualisation (Holmes, 2011; Jacobs et al., 2013). Eco-visualisations can present ecological information to the public in real time displays embodied within artworks, hence allowing invisible human environmental impacts, such as pollution of estuarine ecosystems, to become 'visible' (Glenorchy Sculpture Park, 2017).

The digital technology spectrum now extends from Web 2.0 and emerging Web 3.0 internet applications and social media, through mobile software apps and onto virtual reality and augmented virtual reality applications (Dieck et al., 2016). The so-called Internet of Things, a form of augmented virtual reality, is one of the most recent additions to this digital continuum (Coccoli & Torre 2014).One uniting feature of the diverse components of this continuum is the contribution they all can make toward future, digital public education or e-learning (Liebowitz & Frank, 2016; Thornhill-Miller & Dupont, 2016). Recent research has envisioned the likely impact and disruption that digital technologies are likely to have over the next five to ten years on learning in general (Deloitte, 2016) and through a wide range of formal and informal public educational institutions: from libraries and museums (Johnson et al., 2015), to schools (Khaddage, Muller & Flintoff, 2016) and the higher education sector (Bell et al., 2017).

Taken together, these various research strands suggest that 'digital disruption' may radically reshape the way that a range of education services are delivered and learner engagement fostered over the mid-term to longer-term future. A perfect example of this

transition is provided by the evolution of so called Massive Online Open Courses or MOOCs. In the form of adult, tertiary level education packages these are often provided by reputable, higher education institutions, are often free to online learners, and already cover a surprisingly wide range of topics, including many with

public sustainability engagement potential (Open2Study, 2017; University of

Queensland, 2017).

Digital disruption may provide both great challenges to the named institutions, but also, in the case of libraries, museums and galleries, probable opportunities to extend the reach of public sustainability engagement in conjunction with environmental art practice. For example, one recent report commenting upon digital disruption (Johnson et al., 2015, p.8) envisages a changed but enhanced role for art practice in conjunction with the museum sector, and as facilitated through digital technology:

> Age-old perspectives of the artist as a drawer, painter, or sculptor have broadened vastly, and technology has unleashed seemingly limitless possibilities for different types of talents to enter the field. Museums are uniquely suited to maximize the emotional impact of these creative works by configuring custom, technology-enhanced spaces to enhance and personalize the visitor experience.

The use of the digital technology spectrum to present art and cultural objects is now moving beyond social media engagement of art audiences, and the use of mobile software applications, and on to virtual reality or augmented virtual reality technologies (Virtual Reality Society, 2017).The presentation of art and art related information using these latter technologies takes place, for instance on very large static or touch sensitive screens in museums (National Museum of Singapore, 2017; Smithsonian National Museum of Natural History, 2017) increasingly ubiquitous Smart, hand held devices (Guthrie & Standley, 2017; Tamworth Regional Council, 2017) or on more elaborate

headsets (Dieck et al., 2016).Such presentation of art through digital technology has expanded dramatically within the last 5-10 years, and this trend is predicted to continue (Johnson et.,2015).

The implications of how this ‘digital disruption’ may change the way in which audiences interact with environmental art, and therefore engage with environmental sustainability issues through this medium, is still evolving. Some limited research has started to explore the audience engagement potential of digital eco-art projected onto the natural world (Coles & Pasquier, 2015) or the use of virtual reality and immersive art experiences to develop increased empathy for the natural world (Ahn et al., 2016).

Notwithstanding these welcome early research studies, at present only limited, sporadic research is occurring in this potentially fruitful area of environmental art dissemination and sustainability engagement through digital technology. With regard to the present study, and in the light of the various findings from the literature, an underpinning research question connected to this intended contribution was framed as follows:

- Can software applications and other digital art dissemination technologies enhance the engagement of future audiences with environmental problems and risks as presented through environmental art practice?

1.3.3 Engagement through museum presentation of environmental art

The third contribution within this research was achieved by combining a critical analysis of the academic literature with interviews of a cohort of the research population representing Australian environmental art and museum and gallery practice. I was interested to gain feedback from this group on their perception of the environmental sustainability engagement potential of these sectors in microcosm. Throughout the remainder of this thesis I use the terms ‘museums’ or ‘museum sector’ in the understanding that it also refers to art galleries that are closely associated, in location and

practice ethos, with museums. Such a close relationship between museum and art gallery existed for all of the exhibiting institutions within the present case study. Additionally, former distinctions between museum and gallery purpose is being blurred by developments in the digital technology presentation of art objects and collections from within these institutions as described in Section 1.3.2.

Within the museum sector globally there has been major change within institutional culture and curatorial practice, particularly within the last 15 years or so, toward greater participatory engagement with audiences (Brooklyn Museum, 2014) toward uptake of new digital technologies affecting art object collection, maintenance and presentation (Museum of Old and New Art, 2017) and toward new forms of public digital engagement allowing far greater audience control of the flow of information in museum spaces, and the educational process associated with art presentation than has been possible hitherto (Pulh & Mencarelli, 2015 ; Mazzola, 2015). Such developments could open up the opportunity for greater levels of public participative engagement with environmental art; and perhaps help move the museum sector toward more assertive advocacy on linked social justice and environmental issues, such as climate change (Newell, Robin & Wehner, 2016). I was curious to learn, therefore, what the museum and artist cohorts within my research population thought about these changes.Particularly with regard to their professional engagement in the more participative, digitally literate, sustainability oriented communities of interest they may end up catering to in the future. The underpinning research question linked to this intended contribution was framed as follows:

- Is there a capacity for the museum and gallery sector in Australia to play an enhanced role as a public space for proactive, sustainability engagement of individuals and communities with contemporary environmental problems and risks?

I now shift attention, briefly, to the historical background of environmental art evolution; and consider some links between environmental art and science as a way of foreshadowing the story of the Bimblebox exhibition's development, and its particular art advocacy and public engagement rationale. Detailed insights on the exhibition, including commentary from contributing artists, will be covered in Chapter 2.

1.4 The Nexus of Environmental Art, Science and Public Sustainability Engagement

The Bimblebox: art-science-nature exhibition can be considered as a contemporary artistic response to major environmental threats. Historically, however, the exhibition sits in a much older tradition of environmental science and art intersection dating back to at least the mid-twentieth century; and before that, arguably, all the way back to the earliest artistic depictions associated with a surmised, major increase in human cognitive expression of the relationship between humans and the natural world. That point may have occurred over 70,000 years ago (Harari, 2014).Contemporary environmental art can be defined as 'art that helps

improve our relationship with the natural world' (Hull, 2010) or art 'that aims to stimulate discussion and/or action around nature to contribute to solutions to environmental problems. the intent is to foster pro-environmental awareness, attitudes and behaviours' (Marks, 2017, p. 31).

I have provided a simple typology of the character and objectives of contemporary environmental art practice in Table A1 of Appendix A and I use this typology to help describe aspects of specific artworks within the Bimblebox: art-science-nature exhibition in Chapter 2. I have also listed some of the main functions of environmental science in Table A1 for ease of comparison with art practice.

1.4.1 Environmental art development

As recognised in some quarters of contemporary culture, environmental art is a new branch of artistic expression, emerging from a twentieth century upsurge in global environmental concern, and, arguably, commencing with the Land and Earth art movements which appeared from the mid-1950s onward (Bower, 2010). The field of environmental art has now evolved to be a generic term covering a plethora of specialisations and orientations. Genres can be identified in terms of the predominate objective of the artworks produced, or the degree of environmental intervention undertaken by the artists themselves. Thus, Eco and Ecological art, Land and Earth art, Eco-art and Ecovention are all terms now in use for such specialisation, some interchangeably (Bower, 2010; Marks, 2017).

Whether considered to be a novel genre of art or not, there is a strong continuity between the intent of present and earlier environment oriented art practice deployment in the service of public engagement. This is practice continuity of focus upon what we would now term sustainability issues, involving environmental and social justice impacts or problems; particularly as those issues have been associated with community capacity building initiatives. The last 40 years or so have witnessed many precedents for the use of art in this regard (Bower, 2010; Brown, 2014; Fox, 2015; Marks, 2017).

For instance, the necessary ‘cultural and aesthetic’ dimensions of public education on environmental issues were noted as far back as the mid-1970s in the foundation UNESCO strategy document, the Belgrade Charter (Bishop et al., 2000). Equally, the various genres of art that have been used to help energise past citizen activism and environmental protest movements, as in Australia from the 1970s onwards, has been well documented (Branagan, 2013). Such informal lines of evidence for the perceived importance of art influence on public sustainability engagement have,

therefore, been longstanding.

Clearly, there has been an international vision, going back to at least the 1970s, to use informal and formal educational processes, incorporating art practice in various forms, to develop an environmentally literate, global population; one which could actively engage with sustainability risks and impacts through informed environmental citizenship. The important role of art in achieving this vision has continued to be articulated in contemporary strategies. The language now, however, positions art practice within a more interdisciplinary framework in the call for a: ‘pivotal role that arts, engineering, the humanities, mathematics, natural and social sciences, and technology must play to catalyse innovation and bring about a global agenda for ecologically sustainable development.’ (Gyeongju Action Plan, 2016).

This interdisciplinary focus within the recent vision for an enhanced public sustainability engagement agenda, incorporating the use of the arts (Gyeongju Action Plan, 2016) was one factor that caused me to extend my initial research focus into the arts-based sustainability intersection already mentioned. Notwithstanding the continuity of international vision regarding the valuation of environmental art practice, the mainstream adoption of environmental art by the wider artistic community seems to have been a far more recent phenomenon, according to researchers such as Brown. In 2014 he suggested that: ‘once an area of interest for a relatively small group of people, art that addresses environmental issues has, in the last five years, become part of the artistic mainstream (Brown, 2014).

1.4.2 Environmental science development

The appearance of environmental science, as a specialist discipline within contemporary generic science, shares approximately the same chronology as the evolution of environmental art as a genre within generic art practice. Environmental

science first appeared as a named specialism in the early 1960s, coinciding with the first intimations of wide scale, global environmental problems caused by human development (Robin, 2016). The shared chronology of the emergence of environmental science and art is not surprising given the notion that, at any one time in history, art practice has, in part, reflected and expressed the predominant concerns and cultural values of the day. These concerns have included scientific inquiry and, in our own time, the concept of sustainability. In turn, sustainability has been described as 'the art of living well, within the ecological limits of a finite planet. Art is more than an instrument in this process. It's the nature of it.' (Jackson, 2013).

A much older conception of the links between what we now term environmental art and science may have been held by no less a figure than the quintessential Renaissance man, artist, scientist and holistic thinker, Leonardo Da Vinci. He is said to have made the epistemological link between art and science as far back as the fifteenth Century (Capra, 2013); and is quoted as having said that 'art is the queen of all sciences; communicating knowledge to all the generations of the world.' (Lazzari & Schlesier, 2011). If this quote is authentic, it provides interesting, historical support to a seemingly significant upsurge in environmental art-science collaborative projects occurring within the last ten years or so. Aspects of this recent development are considered further in following chapters.

As with environmental art, environmental science over the last 40 years has sat squarely in the service of making contributions to the human-environment relationship which, in some ways, could be considered to parallel the five-point typology of environmental art genres set out in Table A1 of Appendix A. For example, both environmental art and science are said to be able to influence our understanding of the natural world in ways that can educate, engage, and therefore enhance our relationship with it. Such overlap of rationale also helps explain the logical pairing of environmental

art and science in the form of collaborative environmental advocacy projects such as the Bimblebox: art-science-nature exhibition and some other art- science collaborative exhibitions mentioned later in this research.

1.5 Thesis Structure

This thesis comprises six chapters. Chapter 1 has set out the research problem of the environmental attitudes-action gap and described the research questions, objectives and intended contributions underpinning the research. It presents a serious, recent manifestation of the research problem as it occurred in Australia, and explores conceptual links between that manifestation and the Bimblebox exhibition, introduced as a case study focus of this work. The exhibition is described as an artistic and public sustainability engagement resource emerging from a long tradition of environmental art and science intersection; as well as a recent turn toward intensified collaboration between these two great epistemologies of the human- environment relationship.

Chapter 2 describes the Bimblebox: art-science-nature exhibition in terms of the history its creation in 2012, and its links to the social and political milieu of that time. The exhibition is considered variously as a conventionally defined and evaluated touring art exhibition; as a community artistic response to pressing and serious environmental threats; and as an example of contemporary art-science collaboration within the broad field of environmental art practice.

Chapter 3 explains the research design and methods underpinning the study and draws out the connection between the originating stance and intuitions of the researcher, and the academic influences at play as he came into the design phase of the work. The chapter outlines how these elements linked to the choice of mixed method, quantitative and qualitative sampling and how this interfaced with the research questions posed, the intended research contributions, and the key objective of addressing the attitudes-action

gap research problem.

Chapter 4 describes the findings which support the affirmative answers given to all three research questions posed in the work. The first research question is answered by findings from the mixed methods surveying of the Bimblebox exhibition research population. Research question two is answered by findings from the research population response to the mobile software application designed to present the art of the exhibition; combined with published findings from a literature review on art presentation through the still emerging digital technology spectrum. Research question three is addressed by findings taken from the responses of the small cohort of Australian environmental art, museum and gallery practitioners in the present study; combined with published findings on various aspects of the international museum sector.

Chapter 5 discusses the practical implications arising from the results. It considers the public sustainability engagement resource embodied within environmental art practice, and how this resource might be possibly enhanced for engagement purposes; for example, by use of the findings on image efficacy and salience emerging from visual framing and priming research. The discussion then considers the more systematic integration of environmental art practice with the collections, research and public educational expertise of the museum sector; and coupling this with the presentational pull of the existing and emerging digital technology spectrum.

Discussion then turns to whether enhanced public sustainability engagement through this envisaged sustainability intersection could be yet further strengthened by linkage between it and three other initiatives emerging over the last 10 years or so. These initiatives are:

- the renewed focus on education for sustainable development;
- the increasing turn toward collaborative environmental art-science

practice; and

- art practice capability to render the ‘invisible visible’ in the era of the Anthropocene.

The chapter ends with a short consideration of some research limitations in the present work.

Chapter 6 concludes the thesis with a final review of the findings from this research and a reiteration of the importance of environmental art as an empowering educational resource which offers great opportunities for future public sustainability engagement. Some recommendations for possible future research are made; and the chapter ends with an imagined future scenario ‘a day in the future of the enhanced sustainability intersection.’ This is a visualisation of some near-future possibilities for public sustainability engagement that might emerge from the art-centred sustainability intersection described.

CHAPTER 2: The story of the Bimblebox: art-science-nature exhibition

2.1 Introduction

The primary exploration of the Bimblebox: art-science-nature exhibition for the purposes of this research involved its use as a source of social science data. It provided a case study on possible artist, audience and curatorial cognitive, emotional and behavioural response to the environmental artworks contained within the exhibition. The main use of the data from these participants was to explore whether it was possible to further validate any of the findings from recent theoretical models relevant to environmental art influence as produced by researchers such as Klöckner (2013) and Curtis et al., (2014). These models were outlined in Section 1.3.

2.2 Overview of the Bimblebox: art-science-nature exhibition

The Bimblebox: art-science-nature exhibition toured across Australia for almost three years between May 2014 and March 2017. During that time, it was viewed by over 45,500 visitors at 14 diverse museum and gallery venues (Bimblebox Exhibition, 2016). A stated rationale of the exhibition was to use pictorial, installation and electronic art works to improve public appreciation and understanding of the natural world values of the Bimblebox Nature Refuge, a site threatened by proposals for massive coal mining operations in the southern Galilee Basin region of Central Queensland, Australia (Museum and Galleries Queensland, 2016).

The Nature Refuge, a formally remote 8,000-hectare designated nature conservation area, located near the small regional town of Alpha, protects important upland, desert poplar box woodland and Spinifex grass habitat. It has also been a site of important ecological and natural resource management research. At time of writing in early 2017 it continued to be threatened by large scale coal mining development proposals. In terms of a wider artistic context, the Bimblebox contributing artists were not alone in their concerns over the perceived

pernicious influence of coal mining activities. At various times during this research, the Bimblebox exhibition occupied the same museum and gallery venues which were displaying other, contemporary Australian exhibitions focussed on coal mining impacts. Art exhibitions with the evocative and perhaps self-explanatory titles: ‘Black Harvest’ (Devine and Tilley, 2016a) and ‘A Dirty Business’ (Devine et al., 2016b) drew attention, in different ways, to the ecological and human health risks and impacts associated with coal mining activity in urban Australia. In the case of ‘A Dirty Business’ and with echoes of the public contestation linked to the national, environmental attitude-action gap problems already mentioned (see Section 1.1) the contributing artists were described as seeking to ‘interrogate the dichotomous relationship Newcastle and the Hunter Valley, New South Wales, has with the coal sector ... and the ongoing debates surrounding climate change and renewable energies in Australia.’ (Devine et al., 2016b, p.1).

2.3 The Exhibition Considered through Three Frames of Reference

I now describe the Bimblebox: art-science-nature exhibition in more detail, and through three interlinked frames of reference (see Figure 2.1). The first frame positions the Bimblebox exhibition as a conventionally defined, touring art exhibition: one shaped by the

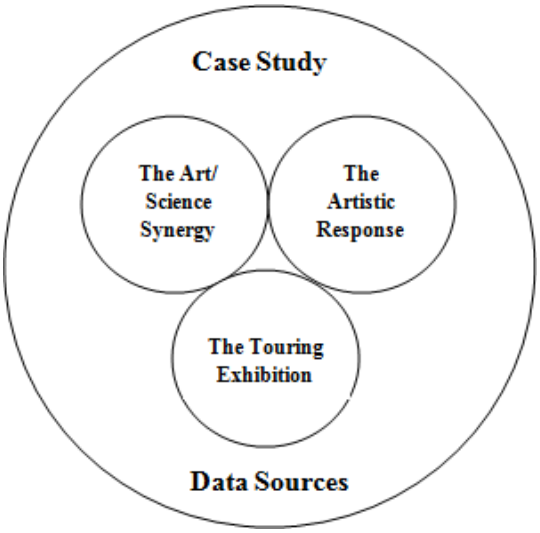


Figure 2.1: Frames of reference used in the case study

professional, organisational, managerial and evaluative processes typical of such a production. Some brief examples of bureaucratic data regarding exhibition funding sources, staffing, touring schedule, and visitor numbers and responses are provided. Such metrics provide a conventional financial and professional curatorial service framework for evaluating public engagement with art practice.

The second frame of reference considers the Bimblebox exhibition as a project which emerged from an artistic response to the threats of environmental problems and impacts associated with coal mining development. I propose that the group of contributing artists who created the diversity of work on view in the exhibition were demonstrating a particular form of environmental art response as embodied in their artworks. One that sought to mediate the socially complex and contested nature of public and political discourse on the serious, continuing, and cumulative environmental impacts and risks posed by greatly expanded fossil fuel extraction operations in contemporary Australia (Franks et al., 2010).

In the context of that discourse, direct quotations from some of the contributing artists later in the chapter give an insight into their aspirations for the intended, environmental advocacy influence of the Bimblebox exhibition. For instance, during the early artistic planning phase, there was a perception that it would be valuable to consider pre-existing public attitudes toward the environmental problems depicted; due to a concern to avoid further polarisation of those attitudes. This particular aspiration was important in shaping the rationale and presentation of the exhibition from the outset.

The third frame of reference used to help understand public engagement with the Bimblebox: art-science-nature exhibition linked to its role as a specific exemplar of collaborative environmental art and science practice. Section 1.4.1 and 1.4.2 provides a simplified outline of the co-evolution of environmental art and science over the last six decades. More recently in Australia, there appears to have been a growing trend toward new

and more systematic forms of environmental art and science engagement and synergy (Trefilova, 2017). This trend was reflected in the Bimblebox exhibition title itself. In Chapter 5 (Section 5.4.2) I discuss the importance of such a turn toward art-science collaboration as an emerging genre of Australian environmental art practice: one, perhaps, which more closely incorporates scientific concepts, insights, findings and framings in order to better achieve public sustainability education and engagement objectives.

The three frames of reference provide a multi-layered perspective of the environmental art exhibition lying at the centre of this study; and audience engagement over its life. I now give more detail for each of the frames.

2.4 Frame 1: Bimblebox: art-science-nature as a Touring Art Exhibition

This framing describes the Bimblebox exhibition as a managed, physical entity during its tour. The official description of the exhibition by the Museums and Galleries (Queensland) organisation which worked in partnership with Jill Sampson (project coordinator), Beth Jackson (curator) and Redland Art Gallery (gallery partner) to develop the exhibition for touring was couched as follows:

> Bimblebox: art-science-nature is a multi-art form exhibition focused on the Bimblebox Nature Refuge, its environmental, social and scientific significance and artists' creative responses to this unique and threatened quintessential Australian landscape. The exhibition includes a wide range of art forms, from conventional landscape painting and drawings to interactive sound sculptures, indigenous artefacts, installation and digital media. The exhibition is also supported by a 120-page digital catalogue and Education Kit. To download the FREE app from iTunes please visit: http://bit.ly/bimblebox.(Museums and Galleries Qld, 2016)

The diverse range of government, philanthropic, art and community sector sponsors supporting the exhibition with finance, consultancy and various other forms of expertise was listed by the same organisation:

Bimblebox: art-science-nature is a touring exhibition partnered by Museums & Galleries Queensland and Redland Art Gallery in association with Bimblebox Nature Refuge. Assisted by the Australian Government through the Australia Council for the Arts, it's funding and advisory body, Visions of Australia program, the Gordon Darling Foundation and proudly sponsored by Artfully, Tangible Media, Planet Boab, Wotif.com, Platypus Graphics, artisan and At a Glance (Museums and Galleries Qld, 2016).

2.4.1Exhibition components

Direct audience interaction with the physical exhibition, as presented in the gallery and museum venues which housed it, could take place in a number of different ways

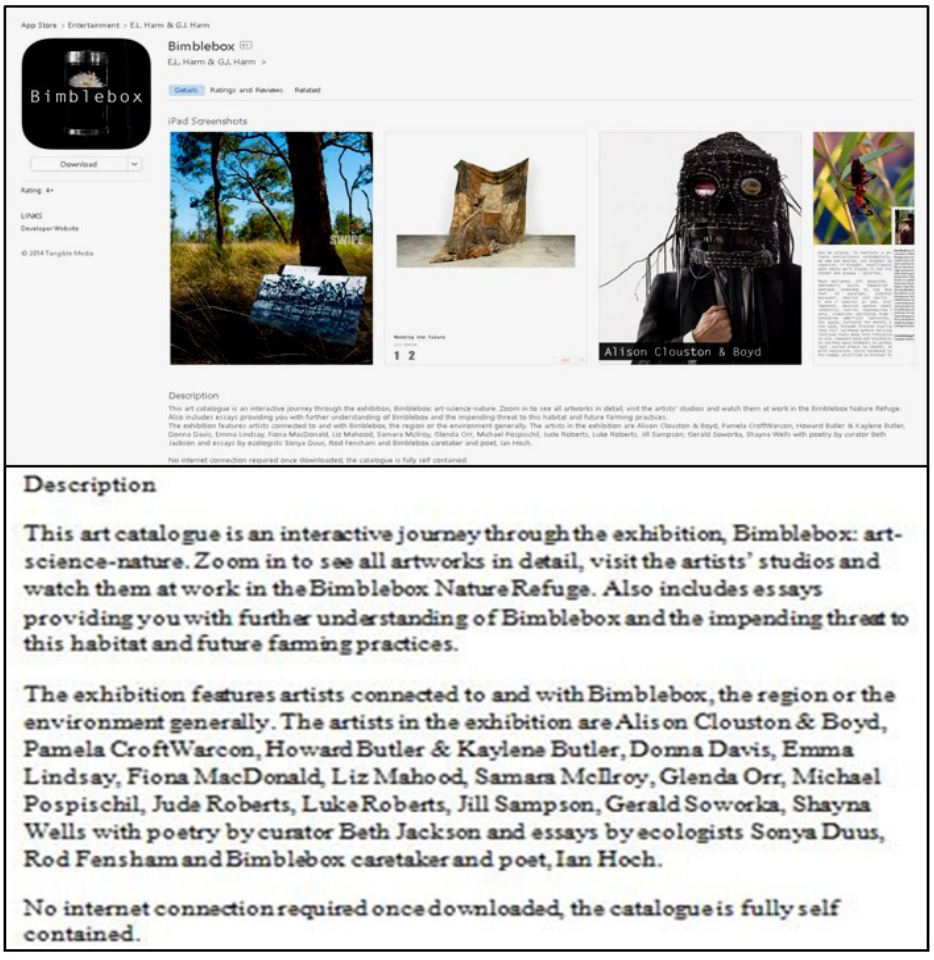


Figure 2.2: Screenshots of the Bimblebox exhibition app, November 2014

depending on which materials were accessed. In terms of live audience viewing, fourteen catalogue listed artworks were on display, and there were a number of other associated art

installations presented as part of the exhibition overall. These were created by the seventeen Bimblebox artists who joined the project at its inception in 2012 and 2013. A printed exhibition catalogue was available for purchase at each venue, and a digital version of this document was also made available for free Internet download by audiences. Additionally, a purpose-designed, mobile software application, or app, was produced for free public download. This multimedia resource acted as a rich information supplement on the exhibition and was intended for display on an iPad device at each venue. A screenshot of this free app, which was still available for download at time of writing in 2017, is depicted as originally advertised on the iTunes platform in 2014 in Figure 2.2.

The likelihood of schools' educational visits to the exhibition was anticipated. As a result, professional educators were used to produce a number of student worksheets, and the subject content of these was linked to the environmental themes depicted within the artworks (Bimblebox Exhibition: Schools Education, 2016). These worksheets were made available for free download by students and teachers – or, in some museum and gallery venues, were printed directly for student use. Some images of the exhibition artworks in situ at various museum and gallery venues are supplied in Figure B1 of Appendix B. A full listing of the various museums and galleries at which the Bimblebox exhibition appeared over its touring life is given in Table B1 of Appendix B.

Promotion of the exhibition was achieved through website listing by the Museums and Galleries Queensland organisation, and by individual museum and gallery venues promoting to their own communities of interest. There was some media reporting of the exhibition through local newspapers and radio, pertinent to the fourteen separate and diverse urban and regional venues in which it was presented across Australia. The project coordinator, Jill Sampson, conducted social media and website advertising of the exhibition in addition to the efforts of the regional galleries (Bimblebox Art Project, Facebook, 2017; Bimblebox Art

Project, Website, 2017). The Bimblebox Nature Refuge support group advertised the exhibition through its newsletters and website (Bimblebox Nature Refuge, 2017) and the group of contributing artists circulated electronic invitations to their networks prior to each showing of the exhibition.

2.4.2 Exhibition management to reduce environmental impacts

One aspect of management of the exhibition which departed from more conventional concerns was the systematic thought given to its ecological impact or 'footprint': encompassing both its art practice, and its touring regime around the country. In recent years there has been growing interest in the environmental impacts of art practice itself; through its consumption of resources and production of wastes (Smith, 2005; International Sculpture Center, 2014). This interest has resulted in attempts at environmental auditing of art practice, with techniques imported from other fields. An early Australian example of such auditing work, from the exhibited environmental art field, was provided by an energy efficiency audit conducted at the Museum of Contemporary Art in Sydney; at the time of an influential exhibition held there in 2010: 'In the Balance: Art For a Changing world' (Museum of Contemporary Art Australia, 2016; Barry, 2010).

Such examples of environmental art practice 'walking the talk' on their approach to energy conservation may be particularly evident when such art is being used to carry a specific advocacy message. An example is provided by the melting ice performance artwork 'Ice Watch' which in 2015 was used to bring attention to climate change induced melting of Arctic ice mass (Woynarski, 2017). This project involved transporting glacier ice blocks from Greenland to Paris; and in this case, the carbon footprint of the logistics involved in creating the work was published online for easy public scrutiny (Eliasson & Rosing, 2015).

Given concern with documenting the environmental impacts of environmental art practice itself, it is notable that within the planning, execution and logistics of the Bimblebox

exhibition, several aspects of ecological footprint concerns were well addressed. For example, the itinerary of national exhibition venues was consciously planned to reduce fuel use and freight costs. The crates used to transport the artworks were made from a honeycomb board composite produced from recycled materials. The companion social media app of the exhibition was conceived, in part, as an electronic catalogue of the artworks, to save paper. The exhibition's physical paper catalogue was deliberately limited to a print run of 1500 copies, and was intentionally produced in a small, A5 size. It was also produced in a digital PDF format for free download. All of these measures were undertaken, consciously, to reduce the consumption of resources and production of waste by the touring exhibition (D. Davis, personal communication, September 9, 2016).

Additionally, many of the artworks in the exhibition were produced following artist experience of residential camps held at the Bimblebox Nature Refuge in 2012 and 2013. Local materials found in situ during these camps were used for creation of many of the works. Examples were tree sap used to create drawing ink, ground up surface rocks used for pigmentation, and the incorporation of the leaves of the Bimblebox or Poplar Box tree itself into one of the artworks. The use of on-site sourced art materials in this way reduced raw materials transportation and consumption. It also demonstrated the process of environmental art creativity being directly shaped by natural forces. This is one of the environmental art genres identified in Table A1 of Appendix A. A selection of the art materials obtained in this way, and an explanation of their artistic value was provided in a separate 'curiosity cabinet' display to accompany the artworks at each exhibition venue. An image of the cabinet is included in panel three of Figure B1 in Appendix B.

2.4.3 Conventional metrics of public engagement with the exhibition

The Bimblebox: art-science-nature physical exhibition had been seen by a recorded national audience of over 45,500 individual visitors by the end of 2016; with a modest addition to that figure expected in the lead up to the completion of its national tour in March 2017.Visitor attendance data as reported by the auspice organisation, Museums and Galleries Queensland is set out in Table 2.1 (Museums and Galleries Queensland, 2014, 2015) The Bimblebox social media app, designed as a companion to the exhibition, had been downloaded on 250 separate occasions at time of writing in June 2017.

Table 2.1: *Visitor attendance data for Bimblebox: art-science-nature 2014-2017*

Year of exhibition	**Visitors to the Bimblebox exhibition**	**Visitors to exhibitions managed by M&G QLD**	**Rank of Bimblebox visitation for that year**
2014 (commenced 18 05 2014)	9,769 (4.8%)	204,392	9th out of 9 exhibitions
2015	15,278 (16%)	95,576	3rd out of 7 exhibitions
2016 *Sub-total (2014 – 16):*	20,538 (19%) *(45,585)*	106,922	2nd out of 9 exhibitions
2017 (concluded 26 03 2017)	not yet released		
Total	45,500 +		

A recording of head count visitation to an art exhibition, or the numbers who access its resources, is one way to consider the extent of audience engagement with the works, and remains a conventional metric in wide use. Such a simple metric, however, does not offer deeper insight into the extent to which audiences might have engaged with the art in wider terms: for example, whether they acquired environmental knowledge through the exhibition; whether they developed an empathic sense for the ecosystems depicted in the artworks; and whether any such influences might carry over into changed, pro-environmental intentions, motivations or behaviours, once an audience had left the exhibition. These are the sorts of indicators of audience sustainability engagement of prime interest in this research.

Selected visitor book comments were collected as an externally generated data source in this study and the process used for this is described in Section 3.2.

2.5 Frame 2: The Exhibition as an Artistic Response to Environmental Threat

2.5.1 The growing environmental threat of coal mining exploration and development

When asked to comment on her motivation for originating the Bimblebox exhibition in 2012, Jill Sampson, initiating and contributing artist, put significant emphasis on the Australian trends in coal mining exploration and development at the time:

> The primary motivation was: nowhere was safe and nowhere still is safe. No bit of land is safe in Australia (from this sort of development) because of our laws. Any bit of land that you care about . . . that you think would be around for your children or grandchildren. (Bimblebox artist and art project coordinator: Jill Sampson, interview 23 May 2016)

This palpable artistic sense of embattled insecurity, in the face of both an observed and reported major expansion of coal mining and coal seam gas operations, was also a feature of more widespread public concern in the Australian state of Queensland, where the Bimblebox exhibition was created. From 2010 onward, popular media in that state started to comment on growing public concern, as evidenced in both street and site activist protests, about the scale of fossil fuel mining proposals for both coal and coal seam gas extraction (Parrington, 2010). An example of this community-based response was provided by the 2010 protest of certain landowners in the Surat Basin region, west of the town of Toowoomba in southern Queensland. A major Brisbane daily newspaper, The Courier Mail, reported at the time that: ‘Dozens of landowners have started blocking access to their properties by coal and gas companies in the Surat Basin, stretching north and west of Toowoomba. Scores more are ready to join them’ (Passmore, 2010).

The popular media was reporting frequently on the greatly expanded coal and gas exploration lease applications and development within Queensland during this period. In 2011, the year before Bimblebox Art Project was begun, the Brisbane Courier Mail reported that:

> Exploration and mining development has exploded to such an extent that almost the entire state is covered by some sort of lease. Farmers are now pitted against global corporations as exploration for coal and minerals alone has jumped by about 1000 per cent in five years and now covers about a quarter of the state. (McCarthy, 2011)

It is perhaps no coincidence that from this same period (2010) two, high profile Australian public campaign groups formed in response to the perception of threat linked either directly or indirectly to increased coal and coal seam gas operations These were 'Lock the Gate' and the 'Climate and Health Alliance' and both organisations commenced a systematic advocacy against perceived threats to agricultural productivity and human health, respectively (Lock the Gate, 2016 ; Climate and Health Alliance, 2016).

The development of the Bimblebox exhibition took place within this atmosphere of reported public foment over fossil fuel extraction, and the gathering public concern that had emerged in that context (Barrett, 2011).This recent period also revealed an intensified level of polarisation in the socio-political response to the Australian coal and coal seam gas mining boom; which has continued up to the time of writing in 2017. For instance, there was commentary from high ranking political figures during this period, at both Australian state and federal level, on the value of coal and coal seam gas extraction to the continued economic prosperity of the country (Peatling & Browne, 2012; Massola, Ker & Cox, 2014). At the same time, there was also well-reported and continuing public activist protests staged at coal mine and coal export sites, calling for a cessation of mining activity on environmental, health and agricultural grounds (Lamacraft, 2014; Connel, Carr & Kirkwood, 2016).These included the

protests at the site of the proposed Adani mega coal mine in northern Queensland (West, 2017) already described in Section 1.1.1.

A broader background, on the divisive nature of contemporary fossil fuel extractive industries, is outside of the scope of this thesis. Previous research e.g., (Duus, 2014) has, however, provided fascinating insights into the history of the deep economic, social and psychological attachment to coal; both in Australia and internationally. Such work helps explain how coal, and other fossil fuels, continue to be equated with narratives of human progress in the minds of some (Duus, 2014).

The recent historical background just described, from 2010 onward, helped frame a growing public perception of a lack of regulatory oversight of coal and coal seam gas mining activity in Australia. This history gave a retrospective context to the creation of the Bimblebox exhibition in relation to the particular power of coal mining interests to threaten the conservation values of the Bimblebox Nature Refuge in central upland Queensland. The refuge is located about 40 km from the small town of Alpha, which in turn is located at the southern end of a large and formally remote region known as the Galilee Basin. It had been known for a long time that the Basin had enormous coal deposits, albeit extremely difficult to access. Nonetheless, these deposits had increasingly become the subject of coal mining interests from the early 2000s onward (The Galilee Basin, 2016).

In 2012, when the Bimblebox: art-science-nature exhibition was first conceived, the Bimblebox Nature Refuge had been under threat from proposed large-scale, open cut and underground coal mining operations for several years. This was despite the fact that the refuge had been originally designated for nature conservation purposes ‘in perpetuity’ with both state and federal government acknowledgement, and their considerable financial assistance. Accordingly, supporters of the Refuge had been shocked to discover that such support did not countermand the ability to prospect and ultimately mine for coal on the site; even though it

was widely accepted that the scale of the mining project being proposed in 2012 would have effectively destroyed the ecology of the area (Bimblebox Nature Refuge, 2017).

It was under these circumstances that art project coordinator Jill Sampson was able to assemble a group of fellow artists prepared to give their voluntary time to travel to the Bimblebox Nature Refuge site, and create art which would bring awareness to its plight. In correspondence, Ms Sampson recalled her surprise at the ultimate completion of the project, given the constraints operating upon it at the time. For instance, it took five months to bring the first group of artists together to attend a residential Refuge camp; then another year for new artists to attend a second camp. Ms Sampson recalled working incredibly long hours and self- funding many aspects of the work to maintain its viability. Notwithstanding, the final outcome of the exhibition was judged worthy of the effort. This was especially true given an artistic perception of the strategic, public engagement opportunity provided by the Nature Refuge, which was to demonstrate the use of environmental art advocacy in the service of protecting important sustainability and conservation values. As Jill Sampson put it:

> I knew about Bimblebox, and I thought: when you have a nature refuge, a place that's also got an agricultural industry on it — a sustainable one — and it has got science engaged in it ... It just ticked all the boxes ... and it should be a place that should unite everybody ... unite the disparate groups that are all fighting for the one thing. (Jill Sampson, Bimblebox artist and art project coordinator, interview 23 May 2016)

2.5.2 The creative process in developing the Bimblebox exhibition in 2012

An initial artist group assembled at a residential camp on the Refuge site in September 2012 with another group following in 2013. These two groups created the bulk of the artworks that were subsequently displayed in the travelling exhibition which toured between 2014 and 2017. The contributing artists produced a diverse range of work from their practice which commenced with a phase of research and initial creative reflection occurring at the 2012 and

2013 camps. A second, long and very important artistic development phase then took place away from the Refuge site, lasting from anywhere between three to fifteen months depending on the nature of the work. None of the art was finished during the residential camp phase, which was rather used for exploration of ideas and materials gathering. A number of the Bimblebox artworks incorporated materials sourced from the refuge site itself. This en plein air, site-specific art process was a deliberate choice for many of the artists in the residential camps. Some of their recorded comments reflect their aspiration to express, through art, the aesthetic and intrinsic value of nature and the 'place story' of the Refuge; and so bring an increased level of public awareness, sensitivity and empathy toward the value of the nature refuge site.

This objective of increasing public awareness was also pursued with cognisance of the fact that the Refuge was not an obviously dramatic landscape or scenically attractive place. In that regard, the reported artistic intention to develop public empathy through creating a 'place story' of the nature refuge site could be considered as an example of an environmental art genre in the service of re-envisioning the human relationship to nature (see Table A1 of Appendix A). The Bimblebox exhibition initiating artist and project coordinator put it this way:

> Bimblebox is not a beautiful area in the way the Franklin River area is. Well, we weren't going to get that same interest for the Galilee Basin. It's flat; it's a semi-desert environment. There are no water features on the Nature Refuge site apart from the dams that have been put in ... or if it rains heavily enough, it's a bit like Channel Country. There was nothing that was going to alert the world ... that this is a special place and we have to save it. So, taking artists out there was a way of interpreting things, not literally. Obviously, some beautiful photographs had been taken out there … but I didn't think that was enough. By taking artists out there and distilling it through their practice...you are taking something and making art that is experiential (Jill Sampson, interview 23 May 2016).

A salient feature of the reported creative process within the contributing artist group

working at the nature refuge in 2012 was the inspirational nature of engagement between individual artists. One particular artist remembered the Bimblebox artist camp experience as an opportunity:

> To meet people and build relationships in such a remote location and with a shared environmental slant to all our personalities...that very quickly came out and everybody was sharing stories about their backgrounds. It was lovely to have an environmental conversation, but also an art conversation. For me it was really about relationships, art, environment … you know it was everything wrapped up into one…it was hard to go to sleep at night because you had so many ideas in your mind and it was racing in so many different areas. (Donna Davies, Bimblebox artist, interview 13 June 2016)

Following the completion of the inaugural, 2012 Bimblebox Nature Refuge artist camp, and a trial display of an early form of the exhibition in Tasmania, the project acquired enabling funding, incorporated some new resource materials, and recruited a professional curator. With these additions, the Bimblebox: art-science-nature exhibition opened in its final form at Redlands Art Gallery, south-east Queensland in May 2014, and went on to complete the national tour.

Significant advocacy messaging was intentionally embodied within the Bimblebox exhibition artworks, and this related to potentially serious environmental and social justice risks and impacts linked to proposed coal mining operations. One example was the artwork by artist Emma Lindsay entitled: *'15 Endangered Black-Throated Finches (Memento Mori for Bimblebox) 2013*' with its depiction of the threats of extinction to a native bird species posed by biodiversity loss; in this particular case, the Black Throated Finch (see panel six in Figure B1 of Appendix B). Another Bimblebox artist, Fiona McDonald, in her *'Mining Galilee' series 2013'* depicted the vulnerable quality of life and social stability of local rural communities in the face of possible impacts of mining operations (see panel two in Figure B1 of Appendix B). Both of these works could be considered representative of an environmental

art genre in the service of providing information, interpretation or education with regard to environmental or related social problems (see Table A1 of Appendix A).

2.5.3 The role of emotion in relation to exhibition art

Various aspects of artistic concern and creativity, as expressed through the range of environmental art genres employed, and the value of socially supportive processes in relation to art creation, have now been described. There was another artistic concern underlying the creation and presentation of the Bimblebox Nature Refuge art, and this linked to the issue of anticipated audience cognitive and emotional response to the artworks. There was an artistic interest in getting the right balance between these two components of anticipated audience experience. So far as public engagement potential was concerned, artist Jill Sampson put it like this:

> I always felt the need for the Bimblebox exhibition to reach people who are not already environmentalists. To bring them into an exhibition that they wouldn't normally be drawn to would be difficult, if it was advertised as an activist exhibition. I think it is fine to shock people; however, educating people is also very important, giving them the knowledge to understand the cost of mining to our future. I think it is important to bring people through the doors then to give them all these emotions (including shock) and hopefully an understanding of what coal mining at Bimblebox and the Galilee Basin will do. (Jill Sampson, interview 23 May 2016).

Another Bimblebox contributing artist described the balance he thought was required for art to become more pro-environmentally engaging; a balance between emotional and intellectual elements within the art, with the former predominating:

> To me, the best way of art to get a message across is the Trojan Horse method ... where you put an image up there and it affects people, directly, emotionally. They are not thinking when they look at it. To me that is the value of changing people's opinions; to affect them emotionally in a way that is not explicit. The Trojan Horse thing is about making people feel emotionally first ... and then they develop ideas

> about that afterwards. The problem you get with some conceptual art, for example, is that it makes people intellectualise too much ... and so they are constantly thinking and not feeling. And so, with my work, my whole aim is not to provoke thought in people . . . I'm just trying to hit them on some subliminal level. (Mick Pospischil, Bimblebox artist, interview 8 May 2016).

Interestingly, research participants reacted to the Bimblebox artworks with both positive and negative emotional expression as described in Section 4.4.5.

2.6 Frame 3: The exhibition as an example of art-science collaborative practice

The third framing of the exhibition described here positioned it as an art-science, collaborative initiative. The art-science synergy within Bimblebox: art-science-nature was derived from two sources. Firstly, the Bimblebox Nature Refuge itself had been the subject of past, scientifically informed natural resource management, as well as botanical and zoological study. Therefore, artistic depiction of the nature refuge, to some extent, subsumed and reflected that existing, scientific orientation. Secondly, several of the Bimblebox exhibition contributing artists made specific reference to scientific understanding of, or scientific research upon the natural world through the artworks they created for the exhibition. An example is the artwork of artist Donna Davis, with her collections of small, on-site botanical specimens and visual reference to scientific research and technical equipment in *'REsearch 2013'* (see panel eight in Figure B1 of Appendix B).

Another example of this science-oriented art practice was provided by artist Glenda Orr, whose work '*Bimblebox Sky Map, 2013'* involved on-site research and experimentation in the production of pigments from tree sap; and the use of mathematical graph paper to present the work (see panel one in Figure B1 of Appendix B). As described in Table A1 of Appendix A, such work can be considered as a genre of environmental art that is in the service of undertaking artistic or scientific research into the processes and functioning of the natural world, from a macro to micro scale.

A reported comment from one of the Bimblebox contributing artists (Emma Lindsay *'15 endangered Black Throated Finches'*) reveals a personal perspective on the wider value and role of the art-science intersection in her work. In commenting on the relative roles that art and science may serve in regard to natural world conservation, this artist points to the advantages art may possess over science in managing to engage the public with often arcane scientific issues; and that artistic interpretation may be able to generate a more vivid, immediate sense of encounter with the natural world:

> Scientists struggle with making their work appeal to a wider public. They do need to use specific terminology in their work and often when they do make new discoveries it can take years for them to get it published ... it's a critical thing that we have speed to communicate important discoveries regarding threatened species and habitat issues when a problem requires immediate public action. Also, people still respond to paintings in a way that defies reason: which they can feel on quite a personal level. As an artist, I am trying to visualise data that in a lab has to be applied and proven in a specific context. I can put data into a visual form that makes it more relevant and accessible to the public. A really important thing for me is to reproduce encounters; all art works made bear witness to my own personal experiences. (Emma Lindsay, Bimblebox artist, interview 12 October 2016)

The value of art-science collaboration considered as a distinctive genre within environmental art is revisited in Section 5.4.2

2.7 Summary

This chapter used three frames of reference to conceptualise the Bimblebox: art-science-nature exhibition. These frames were used to contextualise and nuance the exhibition case study and associated social science data collection that serves as the core resource for this research. The framings positioned the exhibition variously as: a conventionally defined and evaluated touring art exhibition; a community artistic response to pressing and serious environmental threats; and as an example of contemporary art-science collaboration within the broad field of environmental art practice.

In Chapter 3, I now turn to a description of the quantitative and qualitative methods used to analyse the data obtained from the case study of the Bimblebox exhibition.

CHAPTER 3: Research framework and methods

3.1 Introduction

Here I describe the methods used in this research to address the research problem introduced in Chapter 1. I also outline the relationship between method selection and certain influential elements within the overall research design. An early concern for this design was to demonstrate internal validity within the mixed quantitative and qualitative methods framework that was ultimately developed (Tashakkori &Teddlie, 2010). One way to achieve such validity is by articulating a logical connection between the various research elements, and tracing their influence on the final choice of methods selected. In addition to the core objectives of the research as previously described, a number of informal and formal influences also acted upon me to comprise an influential intellectual stance at commencement of the research.

The interconnections of the elements of my research method are set out in Figure 3.1. The development of the methods used in this study was an iterative, non-linear process. Starting in the top left-hand panel of Figure 3.1, one core research objective was to use case study data obtained through quantitative and qualitative survey to search for any corroboration of previous research hypotheses, and theoretical models of environmental art influence onto pro-environmental behaviour. The case study motivational and behavioural response of my research population to the Bimblebox: art-science-nature exhibition provided the main source of data for attempted corroboration purposes, The relatively rare, earlier contributions to this research field, by Klöckner in 2013, and Curtis and colleagues in 2014, were part of the formal influences that shaped my methods, and were selected for attempted corroboration purposes (see Section 1.3, Fig 1.1) .The bottom left hand column panel of Figure 3.1 describes my other intended research objectives and contributions. These related to digital technology and museum and gallery sector contributions to public engagement with

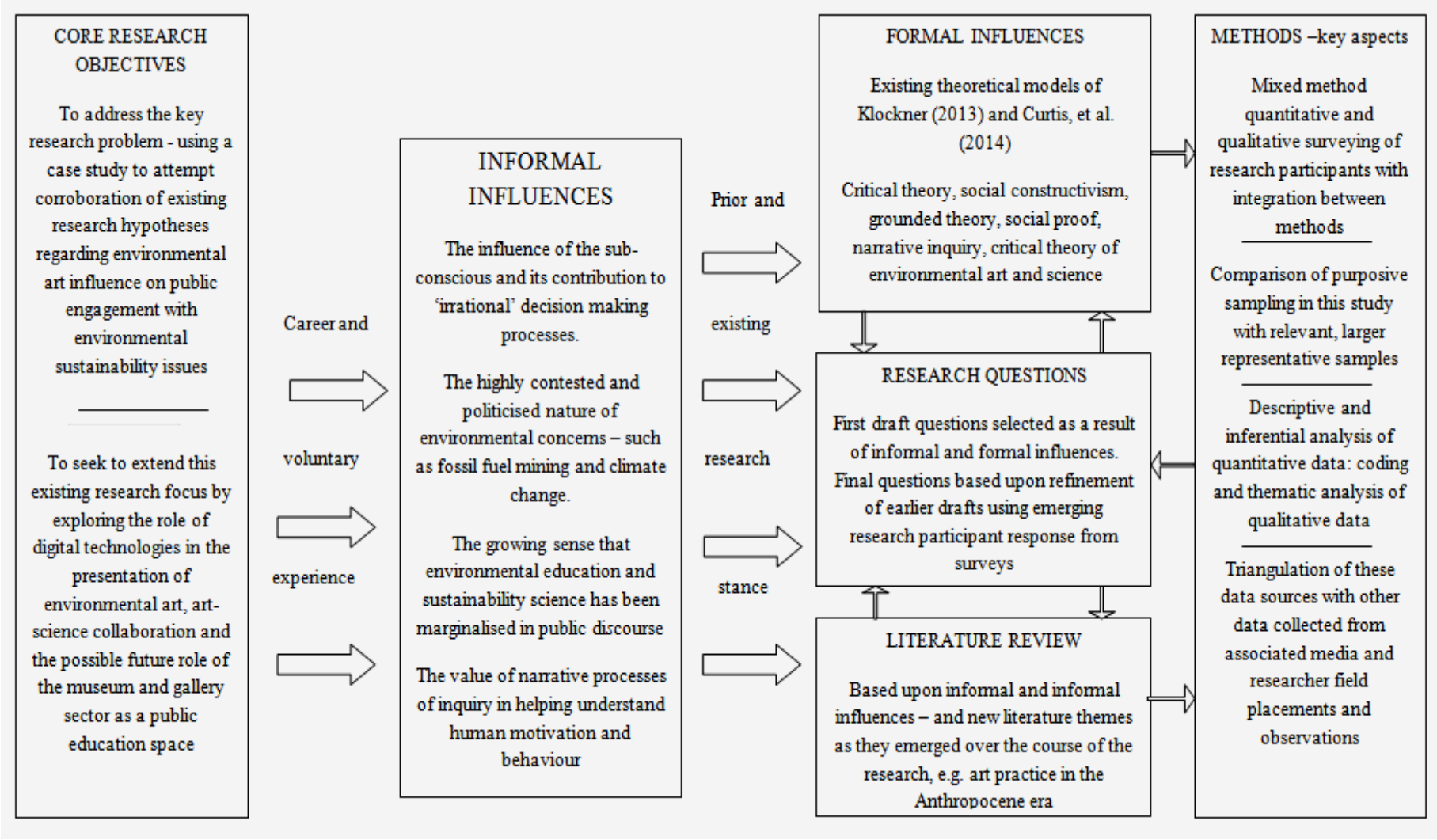


Figure 3.1: The various elements influencing research methods.

environmental art, as already described in Sections 1.3.2 and 1.3.3. In both cases, data for these areas of the research were collected through a combination of literature review, semi-structured and key informant qualitative interviewing methods.

3.1.1 Influences that helped shape theoretical approaches

My prior professional and vocational experience embodied some of the informal influences noted in Figure 3.1.These affected my prior intellectual stance coming into the research, and in turn, inclined me to adopt certain theoretical orientations. For example, my past career in social work and counselling practice had revealed to me the strong influence of sub-conscious psychology on behaviour; and the ability to understand the dynamics of its influence through narrative methods of inquiry. Lifelong concern to help enhance public environmental sustainability engagement through environmental education was another influence; particularly in the light of my own witness to a seemingly growing process of polarisation and marginalisation of environmental science influence in the public sphere over the last 40 years or so.

In terms of formal influences on my selection of methods I have already mentioned the importance of existing environmental art and psychology models (Section 1.3).
Additionally, the tenets of critical theory as it applies to notions of power relations, and human progress and improvement, were already familiar to me from my past social work roles (Fook, 2003; Ife 2012). I was familiar with and attracted to the prospect of conversational interviewing of individuals, and eliciting aspects of the social, psychological and behavioural narrative of their lives. It was a logical extension to include the experience of environmental art in such narratives. Finally, concepts and methods taken from grounded theory, social constructivism and narrative inquiry supplied a methodological framework with which to make meaning of research participant accounts (Birks & Mills, 2011; Denzin & Lincoln, 2005).

3.1.2 A mixed method approach for data collection and analysis

I developed a mixed method research design for this study. In this approach, quantitative and qualitative data sets were obtained through written questionnaire surveys and verbal, semi-structured interviews of my research participant population. These data collection methods were intended to inform and reinforce one another (Creswell, 2013).

All contact with research participants in this study was conducted in accord with protocols approved and reviewed by the Human Research Ethics Committee of the University of New England. Prior to giving their informed consent, participants were fully informed of their various ethical rights, including respectful interviewing by the researcher, confidentiality of their data and the ability to leave the research at any time of their choosing.

The capacity for triangulation and cross-correlation of various data sources, and the strengthening of data interpretation promised by a mixed method approach appealed to me. To use such a framework was also a reminder of the complementary strands of positivistic and interpretive epistemology present in many social science undertakings (Yin, 2015). Other data sources included:

- participant observation during field trips to museum and gallery venues which were presenting the case study exhibition;
- scrutiny of popular media reporting of the Bimblebox exhibition over its touring life;
- compilation of reflective journal notes and grounded theory memos on the overall public response to the exhibition, and;
- action research involvement in certain exhibition related events, such as artist and public panel presentations.

There were other reasons for choosing a mixed methods framework. The 2014 research model produced by Curtis and colleagues, as previously cited, had drawn upon a mixed method analysis of multiple case studies underpinning the original research. Because my work aimed to build on this study, it was logical to orient some elements of my own research methods in a similar way. Additional to the wider theoretical discourse on the value

of mixed methods, I was also attracted by the concept of methodological eclecticism (Tashakkori & Teddlie, 2010).An eclectic approach to methods selection aligned well with my existing preference for holistic, interdependent and interdisciplinary ways of learning. It is also in alignment with a seeming turn within social science research generally toward a strengthening of interdisciplinary approaches to dealing with environmental problems and risks; as demonstrated in the environmental humanities field (Nye et al., 2013).

3.1.3 Development of research questions:

The literature review themes previously identified in Section 1.2, along with my anticipated research methods described above, were key to the development of my three research questions. These questions were the product of several iterations, and were framed in ways which I believed would allow me to make the most useful additions to the existing research literature. The questions are set out in Table 3.1.

Table 3.1: *The Research Question used in the Bimblebox case study*

Research Question 1
Is it possible to further validate other studies on the influence of art on pro-environmental behaviour?
Research Question 2
Can software applications and other digital art dissemination technologies enhance the engagement of future audiences with environmental problems and risks as presented through environmental art practice?
Research Question 3
Is there a capacity for the museum and gallery sector in Australia to play an enhanced role as a public space for proactive, sustainability engagement of individuals and communities with contemporary environmental problems and risks?

3.2 Sampling method and quantitative and qualitative survey design

The sampling method I chose was purposive as opposed to representative for several reasons. Certain cohorts within the research population had already been largely delineated and segmented by the nature of the study itself. This was the case for the self-selecting nature of the Bimblebox exhibition contributing artists, and the museum and gallery staff involved

in presenting the exhibition. There was a good initial response to an invitation to participate in the research from these cohorts. An early trial survey, field observation was conducted at one of the exhibition venues. This led to the conclusion that ad hoc, face-to-face presentation of the initial quantitative survey to exhibition audience members would be unlikely to supply a significant number or diversity of research participants for the audience cohort. The option of buying in a ready-made research population from a market research consultancy for the particular exhibition under study was also ruled out for budgetary reasons.

` These considerations informed the final decision to recruit a purposive sample. A small audience member cohort, which was recruited through participant attendance at the Bimblebox physical exhibition, was augmented from a range of other sources including a 'snowballing' of existing researcher contacts. In practice, this method of sampling led to a small, final research participant population of 79 individuals spread across three sub-population cohorts. The final population was made up of 11 Bimblebox: art-science- nature exhibition contributing artists, 7 museum and gallery staff involved in hosting and presenting the touring exhibition; and 61 exhibition audience members as recruited in the manner described. The audience cohort was further comprised of:

- individuals who had directly visited the physical exhibition at a venue;
- individuals who had seen an indirect representation of the exhibition, either through its published paper or digital catalogue, or its dedicated social media app; and;
- individuals who had experienced a combination of these various ways of encountering the exhibition artworks.

Even though representative sample recruitment was not attempted in this research, I did make a limited comparative assessment of some of the characteristics of the population sample of the present study against larger, representative, research populations used in some recent museum and gallery visitor studies. The findings and implications from this comparison are considered in thesis Section 4.2 dealing with external data sets.

The main quantitative data collection instrument of this research ‘Survey Part A’ comprised of a 23 item, self-report questionnaire survey (see Figure C2, Appendix C). It consisted of a number of multiple choice and Likert Scale questions probing various aspects of research participant experience of the Bimblebox art. These aspects were: participant general perception of the exhibition; the extent of environmental information communicated; the extent of artwork influence on beliefs, attitudes and emotions; and the existing, pro-environmental behaviour profile of participants. In addition, a range of text boxes allowed participants to give more open comments at various points of the survey. The survey was distributed either by paper, email PDF attachment or, later, by Qualtrics platform online distribution.

For the purposes of quantitative survey, the research sample participants were considered in two ways: firstly, as a generic group of environmental citizens who experienced the Bimblebox exhibition in some way; whether professionally or as an audience member; secondly, as representatives of the three sub-sample cohorts of artist, curator or audience member. Some minor modifications of quantitative survey questions across these cohorts were made in order to reflect some baseline differences in research participant experience. For example, by the time ‘Survey Part A’ was first administered to research participants in the contributing artist cohort they had been involved with the Bimblebox exhibition for almost two years; whereas the exhibition was a new experience for most audience cohort members surveyed.

One other source of informal quantitative data relating to the experience of Bimblebox exhibition audience members, external to the specific survey work of this research, was available in the form of comments left by audience members in visitor books provided at museum and gallery venues to obtain written feedback from the public. I visited four museum and gallery exhibition venues for this study and visitor book anecdotal comments were the main way in which subjective experience of audience members was

obtained in each. These informal expressions of audience engagement are provided by a self-selecting group of visitors who are given limited page space to express their views.These factors may partly explain what seemed to be the wholly appreciative and abbreviated tone of most written comments for each venue I visited; and from those venues from which I received previously recorded visitor book data. Notwithstanding this source of possible bias, I decided to incorporate this material into the research; and in the absence of any other official statistics that might characterise the nature of subjective visitor engagement with the sustainability issues portrayed in the Bimblebox exhibition artworks.

The findings from this data are considered as descriptive statistics results in Section 4.3.2.The initial decisions on research sample and quantitative survey design also helped inform the sequencing of the qualitative approach used in this work. The process developed here was, firstly, to administer Survey Part A to research participants. Following the return of that survey, a semi-structured, narrative interview was administered to the same research participants using a qualitative survey instrument entitled ‘Survey Part B’ (see Figure C3, Appendix C). This second, 14 question survey, undertaken through spoken interview was audio recorded, and was conducted with access to the relevant participant responses from Survey Part A, to help shape the discussion and select possible conversational prompts.

The selection of survey items for Survey Part B was derived directly from the core research questions described in Table 3.1. In contrast to the quantitative survey instrument, however, the aim in this case was to use open-ended questions in order to elicit a more flexible and anecdotal response from research participants. As with the quantitative survey method, in the first instance research participants were considered as a group of environmental citizens who experienced the Bimblebox exhibition in some way and secondly within their distinctive cohort role of artist, curator or audience member.

The semi-structured interviews conducted with all research participants using Survey Part B were oriented with the same introductory preamble question of: ‘what is or has been

the “story” of your involvement with this exhibition?’ Within the questions posed, each research participant was encouraged to offer open-ended and anecdotal responses; and there was an opportunity for each participant to pose and answer hypothetical questions they considered might be missing from the interview; and as these might relate to their exhibition experience. In grounded theory terms, the research questions helped provide a ‘storyline’ or overarching scaffold which, in turn, helped structure the process of research participant qualitative and quantitative interview, and also helped keep this process closely linked to the study research objectives and intended contributions outlined in Chapter 1.

The relationship between the two surveys is depicted in Figure 3.2. An initial objective was to administer both the quantitative and semi-structured qualitative Surveys Part A and B to the whole research participant sample assembled at baseline at three points across a 12-month period. This objective was not achieved in practice due to an original participant attrition rate at each survey point, and this issue is considered in the presentation of results in Chapter 4.

3.3 Methods of data analysis

Various quantitative data sets were obtained from the range of multiple choice and Likert Scale questions listed in Survey Part A. The findings from this data included participant response to the Bimblebox art across several categories. These categories were: participant evaluation of the exhibition mobile software app; the preferential choice of most

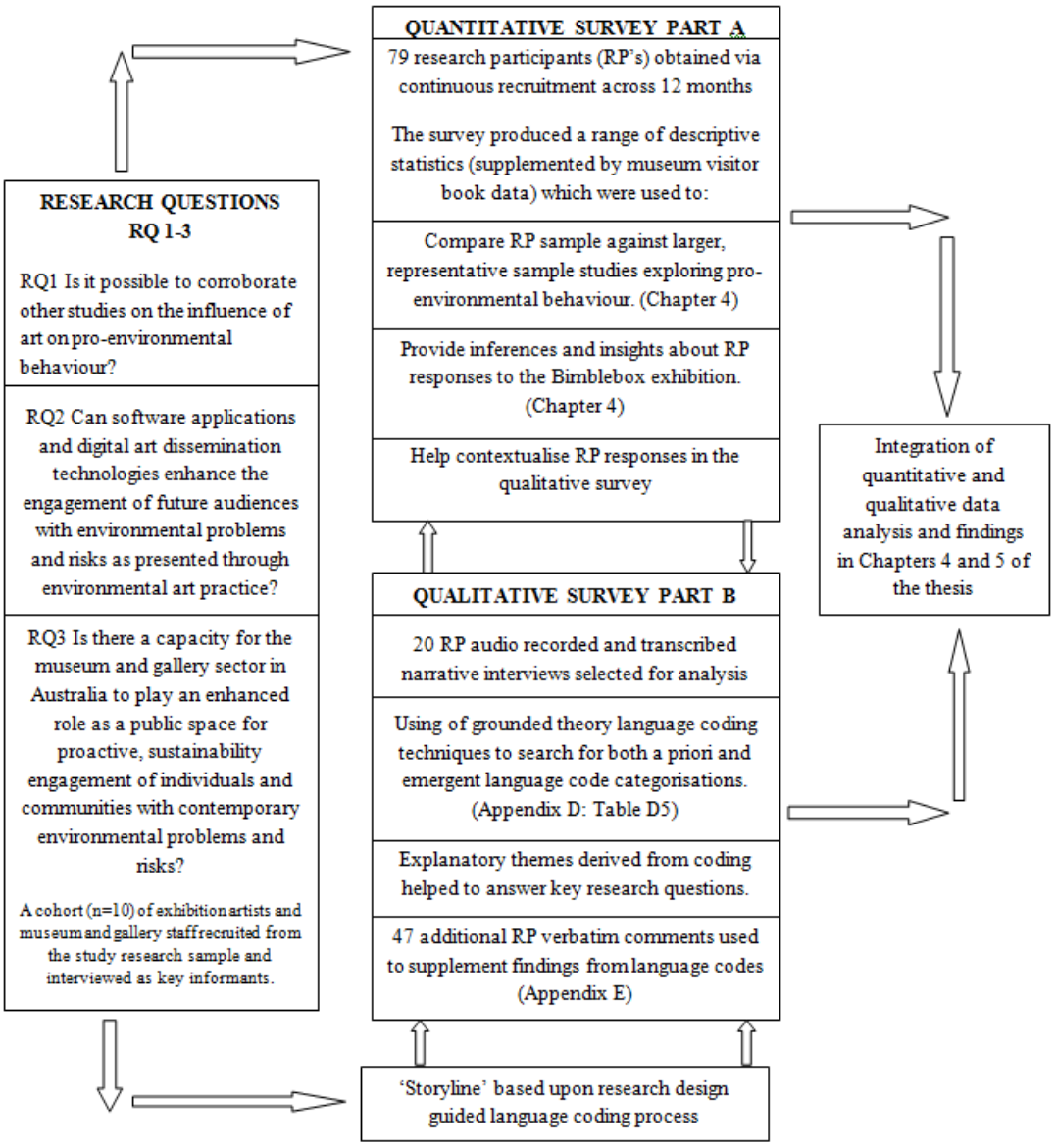


Figure 3.2: The Relationship between Quantitative and Qualitative surveys

favoured artwork; and the educational and emotional influences experienced in relation to the art, to name a few. The findings from these responses and others were collated as descriptive statistics, pie charts and frequency tables and are set out in Sections 4.2 through to 4.4.8. These quantitative findings were then used in conjunction with the qualitative findings obtained in an attempt to verify a selection of components of art influence on pro-environmental behaviour as proposed in the theoretical models used in this study (Curtis et al., 2014; Klöckner, 2013). The selected components of the models for which corroboration was sought are described in Section 4.4.

Qualitative data was obtained from semi-structured interviews of research participants (n=20) which were subjected to language coding of interview transcriptions. These codes were then used to help identify participant comments which might reveal the operation of theoretical model components of environmental art influence within the research population. I searched for any alignment between research participant reported comments made in response to the Bimblebox exhibition artworks; and the components and factors of art influence proposed in the theoretical models used in this study (Curtis et al., 2014; Klöckner 2013). In order to do this, I adapted a grounded theory method suggested within Stuckey's approach to language coding (Stuckey, 2015).

From elements within the conceptual structure of the two published research models, I generated thirteen a priori code descriptions, and then searched for any narrative correlation between these descriptions and the various comments about art experience made by research participants and occurring within the twenty-one hours of interview recordings collected for this research. These a priori codes are referred to within the research findings at various points, particularly in Section 4.4.2 through to 4.4.7, and are set out in the first section of Table D5 of Appendix D. As it developed, this table was also used as a reference directory for coding later research participant interview transcripts.

Using this method, a constant comparison could be made between the descriptions (acting as representations of theoretical mechanisms of pro-environmental influence) and the reported experience of research participants who had interacted with various forms of environmental art practice present within the exhibition. Integral to the process of using these codes was another qualitative, grounded theory method: that of writing research memos (Stuckey, 2015). These self-reflective, explanatory notes are written by the researcher, based upon what he or she hears in interview. They help organise spontaneous thoughts into more coherent ideas and hypothetical concepts regarding the emerging

meaning of the qualitative data. In the present research, these memos were used to help with decisions on the ultimate grouping of language codes into categories, and ultimately, representative themes which could further elucidate findings taken from quantitative survey.

In addition to the a priori codes used for attempted corroboration purposes, several other, so-called emergent codes (considered more endemic or unique to research participant commentary) were also identified (Birks & Mills 2011). As these codes were generated through ongoing interpretation of transcribed research participant comments, they too were constantly compared with earlier responses, and provided a group of additional codes against which to compare future interview responses. As emergent code categorisation proceeded, a considerable number of separate codes were identified, and in association with memo development, these codes were grouped into a number of wider themes which allowed further researcher hypothesising in regard to theoretical model concepts.

The 26 emergent codes generated from 21 hours of transcribed research participant interviews (n=20) are included in the second half of Table D5 of Appendix D. I also collated a number of additional, verbatim comments taken directly from research participant text box responses in Survey Part A. These comments describe the participants' own, subjective perception of possible art influence experienced from the exhibition onto their pro-environmental motivation or intentions. The subjective comments are set out in Appendix E.The final step in my qualitative method was to take the collated a priori and emergent codes obtained from transcriptions and, along with associated memos, to assess the extent of alignment of the qualitative data with the quantitative findings obtained; and to what extent, both forms of data assisted the corroboration of Bimblebox exhibition research participant response inrelation to the existing theoretical art influence model components and mechanisms.

3.3.1 Engagement with art through digital technology and museum presentation

The overall relationship between the various methods described in this Chapter is set out in Table 3.2 for easy reference. Different methods were employed to consider the possible future role of mobile software applications, and other digital technologies, in the presentation of environmental art to engage the public with sustainability issues. Firstly, an analysis was made of the comments taken from the small research sample that experienced the Bimblebox app in the present study. This information was then combined with insights taken from literature review and recent published studies of the use of digital technologies both for art presentation and in other related fields. These two data sources were then used to frame the discussion on the possible future intersection of environmental art and digital technology outlined in Section 5.7.

Another approach was used to consider a possible future role for Australian museums and galleries as public engagement spaces for environmental sustainability issues. In this case, key informant interviews were conducted with some of the Bimblebox exhibition contributing artists, and museum and gallery directors as originally recruited into the research. Research participants from these two cohorts were asked to reflect upon a short resources essay: ‘Where to from here?’ that I wrote using issues identified through literature review (see Figure C4, Appendix C).

The resources essay was developed as group discussion stimulus material as used in some forms of adult educative, study or learning circle techniques for eliciting learner responses (Larsson & Nordvall, 2010). The essay summarised some contemporary trends in the environmental art and museum sectors which hold probable, significant public sustainability engagement implications. The document was circulated in advance of survey interviews taking place. Participants from the art and museum cohorts were then invited to

Table 3.2: *Relationship between research questions, data sources and findings output*

Data sources used	**Contribution to findings output**
Research Question One: Is it possible to verify other studies on the influence of art on pro-environmental behaviour?	
1) Representative population samples taken from published Australian research on museum and gallery attendance, pro-environmental behaviours and public attitudes toward anthropogenic climate change	Helped contextualise some features of the smaller, Bimblebox purposive research population. For example, on pro-environmental behaviour and Worldview, see Tables D1, D 2 and D3 of Appendix D
2) Exhibition visitor book comments (N=125). Tabulation and simple categorization of comments	Provided informal, augmentation of findings gained through analysis of internally generated data.
3) Contents of official literature, documentation and media reporting associated with the exhibition	Helped provide interpretive background for the case study and assisted with structuring qualitative memo writing, transcript coding and thematic analysis
4) Collation of individual quantitative Survey Part A responses by participants (N= 79)	Used to generate statistics to portray the research population profile - see Fig 4.1 this chapter. Also generated statistics on variables linked to environmental art influence to test various hypotheses. See data frequencies in Table 4.1, 4.3 and 4.6 in this chapter
5) Collation of individual qualitative Survey Part B interviews with participants - and from within two focus groups. Coding of transcripts and memo writing to aid a thematic analysis of data (N= 20)	Used to augment quantitative findings linked to hypothesis testing of possible corroboration and to develop possible new theoretical insights. See data in Table D5 of Appendix D and Appendix E
Research Question 2: Can software applications and other digital art dissemination technologies enhance the engagement of future audiences with environmental problems and risks as presented through environmental art practice?	
6) Participant quantitative and qualitative response to the Bimblebox exhibition app (N= 33)	As covered within existing descriptive and qualitative analysis outcomes
7) Literature, case study and key informant review of best practice in the use of art oriented apps and other digital technologies in Australia and internationally.	Provided a snapshot of the current state of play of these enabling technologies as they might enhance public engagement with environmental art in the future.
Research Question 3: Is there a capacity for the museum and gallery sector in Australia to play an enhanced role as a public space for proactive, sustainability engagement of individuals and communities with contemporary environmental problems and risks?	
8) Qualitative interview of a cohort of exhibition artists and museum and gallery staff treated as key informants. A resources essay based on national and international art and museum trends identified from literature was used as stimulus material with this group (N=10).	Provided a thematic report on a microcosm of Australian environmental art and museum practice related to public sustainability engagement. The essay (Figure C4) and survey questions (Table C1) are given in Appendix C. The thematic report is contained in Appendix D, p.198

comment on the essay, as key informants, in the context of any perceived opportunities and challenges arising from the trends described which might exist within their own professional practice, or in terms of their respective employing institutions.

This reflective exercise was conducted using a semi-structured, recorded interview, and the various interview responses were collated to produce a thematic report of the perceptions of the cohorts in the two areas of their respective practice. The contents of the resources essay and survey instrument (Table C1) used for this element of the research are reproduced in Appendix C. The thematic report is reproduced in Appendix D, p.198. The findings described in Chapter 4 follow the order in Table 3.2. The second column of the table lists specific figures or tables of findings, either as provided within Chapter 4 or within various Appendices as stated. Where appropriate, quantitative and qualitative results are discussed together. This approach follows from the mixed method research design of the study. Comparing different data types side by side also increases the strength of their interpretation through triangulation.

3.4 Summary:

This chapter has set out the design and methods underpinning this research, and described the close connection between the originating stance and intuitions of the researcher as he came into the design phase of the work; and the formal and informal intellectual and academic influences at play at that point. The chapter outlined how these elements linked to the choice of sampling strategy, and the specific quantitative and qualitative methods adopted. These various aspects of the research methods described in the chapter intersect. They demonstrate the links between the research questions posed and the intended contributions; ultimately, with the key objective of addressing the original research problem of the environmental attitudes-action gap described in Chapter 1.

CHAPTER 4: Findings and answering the research questions

4.1 Introduction

This chapter sets out the findings generated in response to the research questions (see Chapter 1). The direct findings from this study relating to research question one commence from Section 4.3, and are based on Bimblebox research sample data as described in the various table described within that section. Prior to those descriptions of findings, I consider the use of some external data sources which helped contextualize the Bimblebox research findings.

4.2 Description of the Research Population Compared with External Data Sets

In the present study, 79 participants were recruited using a purposive research sample for the reasons explained in Section 3.2. A degree of demographic skew in the Bimblebox research population across some variables when compared to some larger, representative data sets was borne out by the statistics set out in Table 4.1.

Table 4.1: *Key demographics of the Bimblebox research sample*

VARIABLE	**Number**	**% of total answering the question**	**ean pro-environmental behaviour (PEB) score**
Age cohort (N= 79)			
26-*35* years	6	7.6	49.8
36-45 years	12	15.2	61.3
46-55 years	20	25.3	71.0
56-65 years	31	39.2	71.3
65 years +	10	12.7	71.5
Gender (N= 79)			
Male	23	29.1	69.7
Female	56	70.9	68.6
Education Level (n= 78)			
Graduate or Post Graduate	56	71.8	69.0
Tertiary Diploma or Certificate	14	17.9	70.0
Secondary Schooling	8	10.3	64.75
Residence (N= 79)			
Urban	65	82.3	61.7
Rural	13	16.5	67.5
Overseas/other	1	*1.2*	*95.0*
Occupation (N=77)			

VARIABLE			**Number**	**% of total answering the question**	**Mean pro-environmental behaviour (PEB) score**
Professional			58	75.3	62.4
Other employment			7	9.1	82.9
Unemployed			0		
Retired			12	15.6	66.0
Role in the exhibition (N=79) Mean distance travelled in Kms & hours spent					
Audience member	28.8 Kms	1.4 hr	61	77.2	65.2
Artist	2532.6	851.8	11	13.9	87.5
Museum /Gallery	1502.9	420.5	7	8.9	67.9
Reasons for connecting with exhibition (N=78)					
The art sounded interesting			5	6.4	53.8
Attracted by the environmental message			2	2.6	70.0
The combination of the art and environmental message			17	21.8	70.6
Someone invited me to come or interact			30	38.4	71.4
Chance discovery of the exhibition			7	9.0	72.2
More than one of these reasons			17	21.8	65.0
General art visits in last 12 months (n=78)					
Not at all			9	11.5	48.9
1-2 times			15	19.2	71.7
3-4 times			11	14.2	65.0
More than 6 times			43	55.1	73.3
Environment-themed art visits in the last 5 years (N=78)					
Not at all			22	28.2	57.2
1-2 times			32	41.0	69.9
3-4 times			9	11.5	67.3
More than 6 times			15	19.3	83.0
art–related apps in the last 5 years (N=78)					
Not at all			50	64.2	60.4
1-2 times			14	17.9	70.6
3-4 times			3	3.8	72.0
More than 6 times			11	14.1	73.5
Bimblebox exhibition elements experienced (N=79)					
Saw the physical exhibition at a venue			48	61.5	71.6
Did not see the physical exhibition			31	39.7	63.7
The printed brochure or digital version			75	96.2	66.0
The interactive Bimblebox app			33	42.3	75.0
Attended a workshop or associated activity			21	26.9	78.5
Did not see exhibition but saw the app			12	15.4	69.8
TOTAL POPULATION SAMPLE			**79**		**68.5**

4.2.1 Demographics of the research population

Table 4.1 presents percentage frequency data for key demographic variables obtained from Bimblebox research participants using quantitative Survey Part A. With reference to the age cohort data in the table the Bimblebox research population had a modal age cohort (56-65 years) that was about 30 years older than that described in findings from a much larger (n=3000) Australian cultural events attendance study conducted in 2014 by the Australia Council in a recent report (Australia Council,.2014).The Bimblebox sample possessed higher educational attainment, more professional employment, and had a higher female cohort representation as compared to the approximately equivalent cohorts within the same external study cited.

The reported cumulative attendance for 'general art visits' in the second half of Table was also higher for the Bimblebox population than more representative populations. For example, 89% of the Bimblebox research population reported such visits in a previous 12-month period. This contrasted with attendance at art galleries and museums reported at a 53% frequency in a 2015 survey by the Australian Bureau of Statistics. The latter survey used a very large and representative sample of visitors recruited from the national population (n=21,000).It also showed other demographic contrasts with the Bimblebox population in some of the categories described in the table above (Australian Bureau of Statistics, 2015).

4.2.2 Worldviews of the research population

A worldviews comparison of Bimblebox research participant data was made with a much larger, external data set on public environmental worldviews. A worldview can be defined as a 'mental image of social reality that guides expectations in a society' (Dunlap & Van Liere, 2008, p.19). A worldview comprises various values, belief and attitude systems, and much larger Australian research surveys exploring this element of cognitive influence on environmentally supportive behaviour have demonstrated its significance. For example,

a longitudinal survey of over 5000 individuals conducted by the CSIRO during the period 2010-2014 demonstrated the influential association of different worldview categories on the opinions held by participants regarding anthropogenic climate change causation and effects (Leviston, Greenhill, & Walker, 2015).

The wording of some Bimblebox quantitative survey questions were chosen to match those used in the CSIRO study to allow comparison of findings. The worldview survey statements from which participants were asked to choose, and the tabulation of the comparative data is given in Table D2 in Appendix D. The comparison between the Bimblebox survey population and CSIRO 2015 study findings showed that a larger segment of the Bimblebox population (88%) held a 'fragile environment' worldview at the time of baseline survey. This percentage was more than double that found in the larger CSIRO study.

4.2.3 Environmental behaviour of the research population

The pro-environmental behaviour profiles of the Bimblebox research sample were compared with findings from a well-established, New South Wales longitudinal survey entitled 'Who Cares about the Environment' (NSW Office of Environment and Heritage, 2016). The performance of seven types of similarly defined, occasional environmental behaviours from both surveys was selected for comparison. These behaviours included decisions to reuse something instead of throwing it away, and avoiding plastic bags to carry shopping home. All seven behaviours are listed in Table D1 of Appendix D.

A numerical score was given for the frequency of each behaviour performed in both surveys, noted as 'often' 'sometimes' 'occasionally' or 'never.' The first two frequency categories named were then combined and calculated as a percentage of all responses, as listed in Table D1 of Appendix D. From this table it can be seen that the Bimblebox research sample had a greater percentage representation for every occasional behaviour performed as compared to the NSW sample, except for the category covering home energy efficiency

measures.

In addition to the Bimblebox research sample skew revealed by external data comparisons, the data frequencies contained in Table 4.1 also reveal some internal heterogeneity across variables. A good example of this is provided by the mean values for distance travelled to the Bimblebox exhibition, and time spent engaging with it. The relevant figures are listed in the table in the left-hand column entitled ‘Role in the Exhibition’ where the three vocational cohorts comprising of audience members, contributing artists and museum and gallery curatorial staff, showed a wide data spread. Some of the Bimblebox contributing artists, for instance, reported travel of thousands of kilometres, and thousands of hours of engagement on work associated with the exhibition.

Some curatorial staff also contributed a high number of hours and kilometres travelled in support of the exhibition. At the other extreme, some audience members, who did not view the physical exhibition directly, but rather engaged with a pictorial representation of the artworks through the exhibition paper or pdf catalogue, or companion software mobile application or app, reported spending as little as 20 minutes on their scrutiny of the art depiction, and zero distance travelled as many of them accessed materials from home. Such variation in the experience of the artist, curator and audience sub-sample groups in this research was a recurrent feature. For example, it is also noted in pie charts 4 and 5 of Figure 4.1.on the differential experience of environmental art and art related apps in a previous five-year period.

The various external data comparisons with the Bimblebox research population should be treated with caution due to the lack of comparable methods used in their collection and presentation, and the marked disparity in sample sizes. These comparisons do suggest, however, that the Bimblebox sample probably diverged significantly from the research populations used in some contemporary, larger and representative studies. These studies were selected in the expectation that they would be testing for population psychological and

behavioural effects with some relevance to environmental art influence on individuals and their pro-environmental behaviours. The present study population at baseline was probably older, had a higher female representation, was more engaged with art, was more pro-environmental in its baseline motivations; and more representative of a 'fragile Earth' worldview than were the populations in the other studies cited.

4.3 Responses to the exhibition

4.3.1 General responses

As described in Section 3.2, various forms of participant interaction with the Bimblebox exhibition were surveyed through text box, multiple choice and Likert scale questions in sections 4.1 to 4.7 of Survey Part A (see Figure C2 in Appendix C). The first batch of numerical data obtained from these questions is listed in Table 4.3. In order to compare and interpret the data, the Likert scale responses to Survey Part A question 4.2 were categorised into either a negative or neutral participant response score (survey scores of 1-3 on the five-point scale) or a positive or very positive response score (survey scores of 4-5 on the five-point scale). A percentage frequency for each variable was then calculated and listed in the table. A visual inspection of this data showed noticeable differences between positive and negative score categories.

Table 4.3: *General participant responses to the Bimblebox exhibition*

VARIABLE	**Overall number**	**% Negative or neutral**		**% Positive or very positive**	
		n	%	n	%
General responses to the exhibition					
Response to exhibition as a whole	77	10	13.0	67	87.0
Response to exhibition static works	73	12	16.4	61	83.6
Response to exhibition interactive works	52	20	38.5	32	61.5
Response to exhibition PDF brochure	75	16	21.3	59	78.7
Response to exhibition software app	33	4	12.1	29	87.9
Response to exhibition workshop activity	21	2	9.5	19	90.5

Responses to the exhibition as a whole were overwhelmingly positive; and responses to different aspects of the exhibition, such as the associated exhibition pdf brochure, mobile

software app, and associated museum or gallery public ‘floor talk’ presentations and workshops, ranged from 62% to 91% positive or very positive. The latter result points to the value of the educational reinforcement of environmental art messaging through group interactivity and this subject is taken up in the discussion chapter. In Figure 4.1 pie chart one reveals the relative inexperience of the population with environment-oriented as opposed to generic art exhibitions.

More than a quarter (28%) of research participants reported they had not visited an environment-oriented exhibition at all in the previous five years; and over 40% of the sample reported they had seen only 1-2 such exhibitions in the same period. The following participant comment reflects this statistic:

> I haven’t been to a specific exhibition where environment was the main subject. To be honest I have never really heard of one before (Research participant interview, December, 2016)

Such whole of sample findings on environmental art experience contrasted to those obtained from individual artist, curator or certain audience member cohorts. For instance, within the small sub-sample of 15 individuals who reported having viewed environmental art on more than 6 occasions in the last 5 years, 80% comprised of artists and museum and gallery curators (pie chart 4, Figure 4.1).

In Table 2.1 an annual breakdown was given for the total of 45,500 visitors who saw the Bimblebox: art-science-nature physical exhibition during its touring life between 2014 and 2016.The rank order of the exhibition in terms of visitor numbers attained compared to other exhibitions over that period rose from ninth out of nine exhibitions mounted by the same administrative organisation in 2014, to second out of nine exhibitions mounted in 2016. Those figures suggest that when such an environment themed exhibition does become known to the public, it is well supported.

The present findings also suggest, however, that the visitor motivation behind such attendance is not, primarily, an environmental one. Question 2.1 of the Survey Part A

questionnaire asked the total research population: ‘what made you want to either look at, contribute to or host the exhibition?’ The results are depicted in pie chart 6 of of Figure 4.1. Only a small minority (3 %) cited the advertised environmental message of the exhibition as a primary motive to attend; with twice that percentage (6 %) citing a more generic art interest as being a motivation to visit. Only 22% of the Bimblebox exhibition audience reported being attracted to the exhibition either for the environmental message it contained or the combination of art and the message.

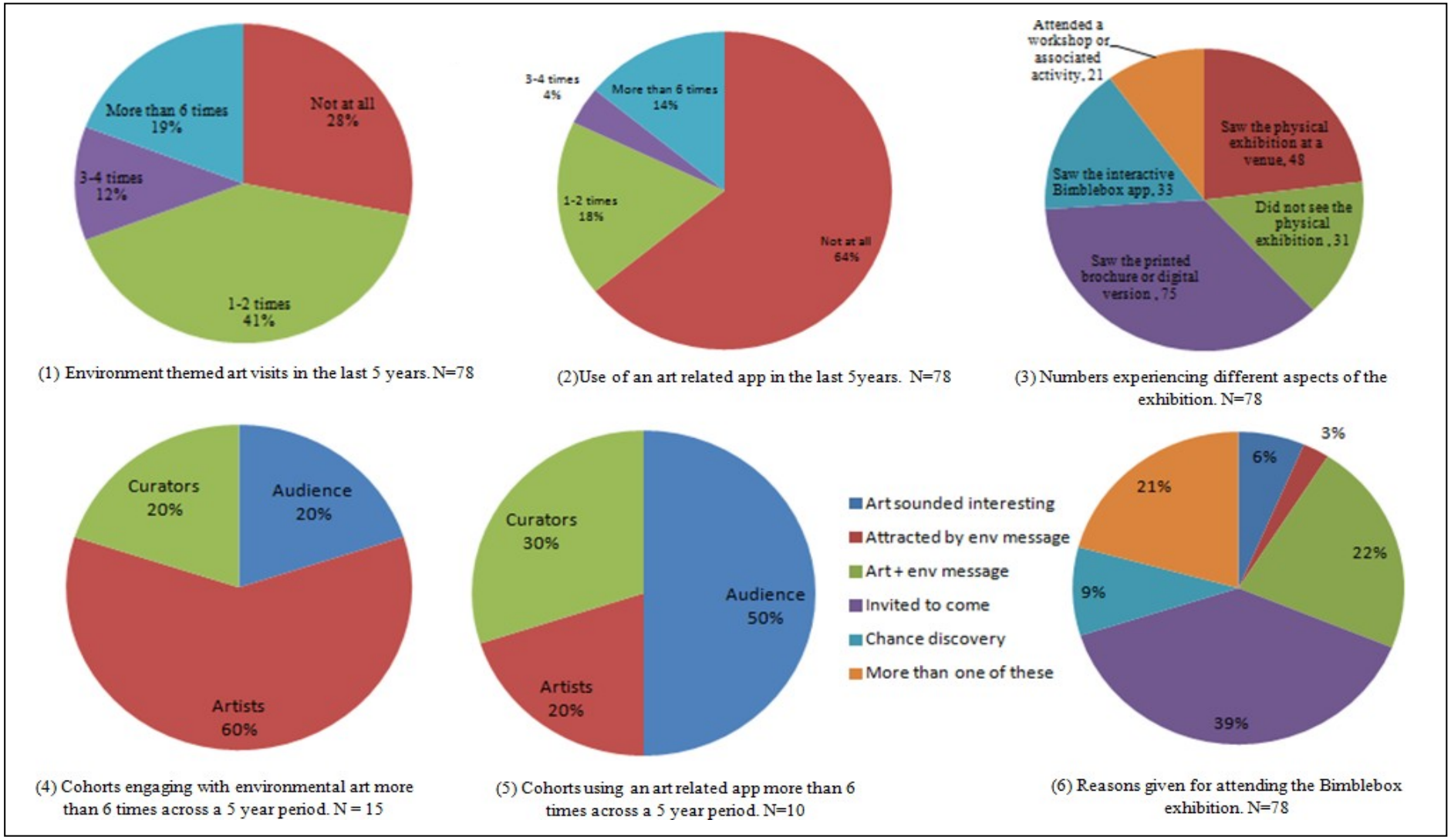


Figure 4.1: Descriptive statistics on art engagement for the Bimblebox research population

4.3.2 Responses recorded in visitor books

Another external source of data scrutinized in this research was Bimblebox exhibition visitor book comments, (see Section 3.2.) I produced a simple, four column, mutually exclusive categorisation of 125 verbatim comments retrieved from six, separate museum and gallery visitor books as set out in Table 4.4. This material was collected from a diverse range of urban and rural exhibition venues located in Adelaide, South Australia, Miles and Toogoolawah in Queensland, and from Newcastle, Armidale, and Manly in New South Wales. A full listing of all Bimblebox exhibition venues, and

Table 4.4: *Simple categorisation of 125 Bimblebox exhibition visitor book comments*

Category of visitor comments (N=125)			
Referring to general appreciation of the exhibition or its ambience	Referring to the technical quality of the art produced	Referring to the general thought provoking or inspiration quality of the art	Referring to specific environmental messages or themes
73% (n = 91)	9 % (n = 11)	12 % (n = 15)	6 % (n = 8)

those visited by the researcher, are contained in Table B1 of Appendix B. The visitor book format usually only allows limited space for brief comments from exhibition audiences. It is perhaps unsurprising, therefore, that a majority of visitor comments (73%) expressed brief, general appreciation: ‘Fantastic!’ ‘Very good, I loved it’ ‘Extraordinary’ ‘Very impressive.’ ‘Strange!’ ‘Fantastic!’ A smaller group of comments (12%) reflected some thought provoking or inspiring effect of the exhibition: ‘Great concept makes the viewer think.’ ‘Great variety of media – thought provoking.’ ‘Incredibly powerful and inspiring.’ Finally, there were a smaller number of comments (6%) which indicated that some audience members had responded to specific environmental themes depicted within the exhibition. Within this group, one or two individuals had commented on implications, or possible action, that might be taken in response to these themes. Examples of such comments included: ‘Congratulations

– a wonderful display of the elements that make this (the Bimblebox nature refuge) area unique' 'Art-Science-Nature - all part of the Future. Coal is Not.' 'Very thought provoking – it will be goodbye to our lovely Bush.' 'We loved the Coal Monster – we must protect our land from coal and gas.' 'A powerful statement for Bimblebox preservation.' 'I hope that this exhibition opens the eyes of all Australians to what is happening around us.'

These data are subjective, based as they are upon visitor anecdotal self-report. Equally, these comments only represent a minority of individuals who self-selected from the total exhibition audiences. Notwithstanding these factors, it is interesting to draw a hypothetical parallel between the small minority of comments in the visitor books relating specifically to environmental themes within the exhibition; and the equally small minority of participants described in pie chart 6 of Figure 4.1 above, who said they attended the Bimblebox exhibition because they were 'attracted to the environmental message.' A similar comparison can be drawn between the 73% of visitor book respondents who were 'appreciative of the exhibition or its ambience' (see Table 4.4) and the high level of positive response by participants to the Bimblebox exhibition as revealed in the present study and described in Table 4.3.

The visitor book data also appears to hold some alignment with other, more objective survey findings described later in this chapter. For example, in terms of quantitative survey findings on artwork educational influence, and on participant intention to engage in future environmentally supportive behaviour, as listed in comments recorded in Appendix E. Finally, this more traditional and simple form of visitor feedback employed by museums and galleries can be contrasted with the growing use of more sophisticated, contemporary digital software for the same purpose. This issue is discussed in Section 5.5

4.3.3 Relative responses to the different artworks

In Survey Part A, (questions 5.1 to 5.3) participants were asked to name the artwork leaving the strongest impression upon them, to explain why this was the case, and to give an interpretation of the main message the work carried for them. The results of this selection are listed in Table 4.5. A selection of individual written comments taken from the audience cohort survey were also used to gain some insight into possible reasons for the clear predominance of two of the artworks named in Table 4.5. These comments are given below.

Table 4.5: *Rank order of artworks preferred by the Bimblebox research population*

Contributing Artist	**Full title of artwork**	**Times selected**	**Social media (mean score)**
Emma Lindsay (Figure B1 Appendix B)	15 endangered black-throated finches (Memento mori for Bimblebox), 2013	24	14.0
Alison Clouston and Boyd (Figure B1, Appendix B)	Coalface, 2014	23	12.9
Jill Sampson (Figure B1, Appendix B)	Mending the Future, 2013	5	13.2
Fiona McDonald (Figure B1, Appendix B, top right)	Mining Jericho from the Mining Galilee series, 2013	5	15.6
Jude Roberts	Shroud for ancient basin, 2013	3	12.7
Luke Roberts (Figure B1, Appendix B, top left)	All Souls Day (Tree), 2009	5	9.0
Michael Pospichil	Magellanic Mirage, 2013	3	11.0
Gerald Sorowka	Bimblebox Art Project: What's yours is my coal mine, 2013	2	11.5
Donna Davies	REsearch (detail), 2013	2	10.5
Glenda Orr	Bimblebox Sky Map 2, 2013	2	8.5
Pamela CroftWarcon, Howard Butler, Kaylene Butler	Honouring Jagalingou country, 2013	1	8.0
Shayna Wells	Reconfigured Landscape no. 2, 2013	0	-
Samara McIlroy	Jaw-war ter-tweet (detail), 2013	0	-

The most selected artwork was by artist Emma Lindsay: *15 Endangered Black-Throated Finches (Memento Mori for Bimblebox), 2013,* with 24 survey responses. An image of this

artwork is given in panel six of Figure B1 in Appendix B. Some of the participant comments given for this artwork were as follows:

> It represents the beginning of the loss that possibly is yet to come. I see those beautiful birds as specimens and lifeless, that says it all. We can't let a need for coalmining (modern needs) destroy a beautiful place. There has to be another way. To save the space and all of its inhabitants, and the stories it tells. Let this just be another chapter.'(Research participant interview, 07 2016)

> It reinforces the message of the imminent destruction of the natural environment. The fragility of nature, once a species is lost or depleted; it disappears and does not return. (Research participant interview, 07 2016)

> Just a little bird but it represents so much. We humans need to make the choice to protect the environment.' (Research participant interview, 01 2017)

The second most selected artwork was 'Coalface, 2014' by artists Alison Clouston and Boyd, with 23 survey responses (see Figure B1 of Appendix B, panel five).Some of the participant comments given for this artwork were as follows:

> I chose Coalface from the images first. I mean, obviously because it was about coal and the issues to do with coal...I understood what it was mainly getting to initially whereas with some of the others (artworks) I wouldn't have understood what its origins were without reading. Obviously my initial interpretation of the exhibit Coalface was different to what was being provided (by the didactic panels) but that is not a bad thing because it still sent a message to me. (Research participant interview, 08 2016)

> It looked like the grim reaper signifying the coming of death, and the bird audio was eerie. If you keep digging up coal from precious land that holds valuable ecosystems, species will be lost. This action will be irreversible, done, finished. Death is imminent (Research participant interview, 06 2016)

> It gave a physical persona to industry presence. It represented the rather foreboding consequences of industry and money or 'progress' – and whether this can be stopped (Research participant interview, 07 2016)

> The skull depicting mindlessness and the clumsy mining ship shoes destroying all in its path. Man (sic) is not being mindful, but is clearing a path for his own selfish benefit, destroying all in his path (Research participant interview, 08 2016)

Another aspect of differential audience response to the exhibition artworks involved their potential distribution across participant social media networks. In question 5.4 of Survey Part A, participants were asked to rate the importance of sharing an image of the Bimblebox artworks on social media. This question was included in order to gauge the influence of the artworks on a potential on-line audience. The relevant frequency data is set out in the fourth row or section of Table 4.6 below.

For the response category ‘share with friends’ only 45% of participants reported a positive or very positive response compared to 55% who were negative or neutral on this topic. The positive responses increased across other categories, with a 64% positive or very positive response for ‘making someone else feel issues were important’ compared to a 36% negative or neutral response. There was a further slight increase in positive response for participant perception of the importance for others to share an exhibition image on social media (65%) positive or very positive; and for the importance in making someone wish to support an environmental NGO (70%) positive or very positive.

The above chance, positive perception of the influence of the networked sharing of art images across social media in the last three categories described is perhaps unsurprising; given the recognised communicative power of social media generally. The weaker perception of social media imagery influence attaching to the category ‘sharing with friends’ in this study is harder to explain. Perhaps it might link to a difference in audience member intensity of experience of a real as opposed to a digital representation of an artwork? This aspect of present findings suggests a value for further research into the public engagement potential of social media distribution of artwork for educative or

motivational purpose.

Table 4.6: *Educational and emotional influences of the exhibition on participants*

VARIABLE	**Overall number**	**% Negative or neutral**		**% Positive or very positive**	
		n	%	n	%
Generic environmental influence of the exhibition					
Learned about environmental issues	77	15	19.5	62	80.5
Caused to seek out information	78	35	44.9	43	55.1
Exposed to new ideas	78	38	48.7	40	51.3
Affirmed beliefs on environment relationships	75	18	24.0	57	76.0
Support for NGO's	77	28	36.4	49	63.6
Want to reduce impact	76	35	46.1	41	53.9
Caused to reflect on environment relationship	76	18	23.4	59	76.6
Strength and valence of emotion					
Moved me emotionally	76	24	31.6	52	68.4
Type of emotional mood produced by the art +/-	60	50	83.3	10	16.7
Strength of emotional impact	76	31	40.8	45	59.2
Education and awareness raising on specific environmental art themes					
Managing the land	77	37	48.1	40	51.9
Impacts of coal mining	78	23	30.0	55	71.0
Value of nature refuges	78	23	29.5	55	70.5
Managing groundwater	76	40	52.6	36	47.4
Regional community effects	77	29	37.7	48	62.3
Human influence on climate change	78	35	44.9	43	55.1
Perception of artwork use on social media					
Share with friends	76	42	55.3	34	44.7
Make someone else feel issues important	70	25	35.7	45	64.3
Important for others to share the image	71	25	35.2	46	64.8
Important in making someone support an NGO	69	21	30.4	48	69.6
Type of emotional response to the exhibition N=50					
Citing discrete category positive or negative emotions	38	32	64%	6	12%
Citing mixed negative and positive emotional responses	12	6	12%	6	12%

In the present study a comparison was also made between the numbers of times an artwork in the exhibition had been selected for its impact or salience on the participant audience, and a mean social media preference score for that artwork: calculated from the

number of participant responses in each social media category for the individual artwork concerned (see columns three and four of Table 4.5.) A visual inspection and scatter plot of the data suggested no strong correlation between these two variables. For example, the most selected artwork, by artist Emma Lindsay, which received 24 participant selections, received a smaller social media score (14.0) than did an artwork with only 5 selections, by artist Fiona McDonald (social media score of 15.6). The second most selected artwork, by Alison Clouston and Boyd, which received 23 selections, obtained a social media score (12.9) only marginally different to a work by artist Jude Roberts (12.7) which was selected three times.

A Pearson correlation test using the SPSS 24 package confirmed this anticipated lack of relationship. It revealed no significant correlation between the rank order of artworks and any of the social media networking categories described. For example, when the variable 'sharing images on social media with friends' was tabulated against artwork rank order, the result was as follows (Pearson correlation =-.169, n= 75, Sig (2-tailed) =.150, $p < .05$).A possible explanation for these seemingly counterintuitive findings on the social media distribution of environmental art is given in thesis section 5.1.3; as part of a discussion on visual framing theory, and the differential effects of image salience and efficacy in relation to artwork influence on pro-environmental engagement. Having outlined features of the research findings in general descriptive terms I now turn to the findings on each of the specific research questions listed in Table 3.1, starting with data that supports corroboration of other studies and theoretical models of art influence on pro-environmental behaviour.

4.4 Research Question 1: Verification of Other studies on the Influence of Art on Pro-environmental Behaviour

Research question one as listed in Table 3.1 asked: 'Is it possible to verify other studies on the influence of art on pro-environmental behaviour?' This question aligned with an alternative hypothesis that theoretical mechanisms and components of environmental art

influence would occur, and would be detectable, within the research population viewing the Bimblebox: art-science-nature exhibition. The findings presented in this section of the chapter were used to test this hypothesis by searching for any possible corroboration of particular components of the Curtis and Klöckner theoretical models (Figure 1.1). I commence with my findings on the theoretical model component of awareness of consequences as generated by art influence; and as interpreted through some of the antecedents to such awareness in terms of the environmental education of participants by the Bimblebox art and the awareness of specific environmental themes they reported.

4.4.1 Influence of the exhibition on awareness of consequences

In Table 4.6 the relevant findings relating to awareness of consequences are collated under the headings of 'generic environmental influence of the exhibition' and 'education and awareness raising on specific environmental art themes.' The frequency data in Table 4.6 was interpreted using the same process as described in Section 4.3. The data showed noticeable differences between positive and negative categories of response to question 4.3 in Survey Part A. There was a significant positive or very positive participant response to exhibition experience in the categories of 'learned about environmental issues' (81%); on whether the exhibition had 'affirmed beliefs on environment relationships' (76%) and whether participants had been 'caused to reflect on environment relationships' (77%).

These quantitative findings were further corroborated by qualitative, a priori language code findings (all coloured red in Table D5 of Appendix D) on the relative importance of theoretical model components acting upon the research population, as revealed in transcribed interview comments. For example, the rank ordering of the top two a priori codes was: 'recognition of environmental information communicated and possible reflection upon it' (red colour code CI); and 'awareness of environmental consequences as elicited by the artworks' (red colour code AC). The effect of educative, affirming and reflective

influences produced by the experience of the Bimblebox art was also related to the recognition of a participant ecological self-concept, in which environmental conservation themes figured prominently (red code SC, fourth in rank order), and a sense of participant empathy for the natural environment (red code ENE, fifth rank order).

Verbatim written comments given by participants added further qualitative evidence of the strength of participant perception of exhibition artwork influence upon them. These comments were given by participants in text box responses in Survey Part A. They demonstrate a perceived effect of environmental art influence onto participant awareness of consequences. A few comments are given below, with the remainder listed in Appendix E:

> Birds, animals, the landscape are being destroyed by our actions, specifically mining, and we are causing extinction of lively beings (Research participant Survey A response, 07, 2016)

> A very interesting exhibition, with the use of art to highlight dangers to the environment caused by mineral extraction. There is currently a race between the destruction of the environment and the use of new technologies which will make power production, such as open coal mining, redundant (Research participant Survey A response, 11 2016)

> This exhibition made me aware of the issues faced at Bimblebox and I have followed these in the media and supported organisations attempting to halt the mining. (Research participant Survey A response, 08, 2016)

These comments suggest that participant experience of the Bimblebox exhibition, and subsequent environmental knowledge acquisition, led some participants to consolidate and extend an existing level of pro-environmental awareness and motivation concerning the negative environmental issues the exhibition represented. One implication of this finding is discussed in thesis section 5.1.5.

4.4.2 Influence of the exhibition on social norms

Another important component proposed in both the Curtis and Klöckner models was social norm influence linked to pro-environmental motivation. A specific question on this component of influence was not asked in Survey Part A, but something of a proxy for it was represented by participant responses to question 5.4. This dealt with participant perception of the value of exhibition artwork distribution on social media (see Table 4.6). The relevant findings are detailed in the fourth row or section of Table 4.6 and show that 64% of participants gave a positive or very positive response to the idea that social media sharing of exhibition images would assist in 'making someone else feel issues were important' as compared to only 36% of participants who gave a negative or neutral response to this idea. There was also a 65% positive or very positive response to the idea of other people sharing an exhibition image on social media. The importance of social media sharing of images in making someone else wish to support an environmental NGO, received a 70% positive or very positive participant response.

These findings suggest a positive evaluation given to the socially networked influence of art imagery; and in survey or interview several participants described directly sharing Bimblebox art imagery on social media, or discussing the experience of the exhibition art across their personal networks:

> Being part of this project has really driven an enthusiasm in me about the Bimblebox art. To the point that it has been the major focus of dinner party and social discussion with our friends (Research participant comment in Survey Part A, 08 2017)

The touring exhibition's residency at a venue in Bunbury, Western Australia, in October to November 2014, led to two further art advocacy projects: 'Transplanting Disobedience' which focused on local coalmining impacts, and 'Artists at the Helm' which advocated for protection of a local native forest block. This artistic activism was considered to have been

catalysed directly from the experience and response of local artists who had visited the Bimblebox exhibition in Bunbury (Bunbury Regional Art Galleries, 2016).This capacity building potential of an artists' collective was well recognised by some of the participants in the present study:

> The passion of a group of artists getting together, and what this can do in a sustainable way, and how it can connect with other art projects to cover the whole issue of environmental devastation and the impacts of mining (Research participant comment taken from transcript, 02 2017)

In the same vein, the creativity of the initial Bimblebox exhibition contributing artist groups was considered such a success that it led to an annual artist camp meeting on the Bimblebox nature refuge site. These camps have produced further exhibitions of environment oriented artworks. An example is the Bimblebox MMXIV exhibition shown at Ipswich, Queensland in 2015 (Bimblebox MMXIV, 2015).

The artistic catalyst created by the original Bimblebox exhibition was also exemplified by Jill Sampson, the initiating artist and project coordinator of the Bimblebox travelling exhibition, who developed another pro-environmental art advocacy exhibition linked to the Bimblebox Nature Refuge. The exhibition 'Bimblebox 153 Birds' focuses specifically on the threat posed by coal mining to the over 150 bird species identified on the Refuge over time. The total preparatory and voluntary commitment involved with this art project was even greater than that involved in the original Bimblebox: art-science-nature exhibition. An estimated 440 national and international artists, writers and musicians have contributed to this project, as well as additional volunteers who helped mount early presentations of the exhibition (Bimblebox 153 Birds, 2016).

Qualitative findings provided further evidence of pro-environmental, social norm and social contagion influence associated with the Bimblebox artworks and contributing artists. The third most frequent a priori language code taken from participant interview transcription

(see Table D4 in

Appendix D, red code SN) was identified as: ‘pro-environmental influence on participants through their admiration of the personal and social norms held by the exhibition artists.’ A number of research participant comments, taken from surveys and interview transcripts, revealed a direct perception of influence from the pro-environmental advocacy demonstrated by the Bimblebox artists:

> This exhibition and those who created it are the force that will continue to inform and re-enforce the value of thinking and doing more to ensure environmental sustainability. I would not have come to hold these views unless those with more knowledge, greater understanding and a more refined artistic sensibility had contributed their view of the world and therefore affected mine. May they
> continue to do so. I have great respect for those who contribute to a better world in this way (Research participant comment taken from Survey Part A, 05 2016)

4.4.3 Influence of the exhibition on beliefs and attitudes

In Table 4.6 findings on participant responses under the first row heading of ‘generic environmental influence of the exhibition’ revealed that the exhibition had ‘affirmed participant beliefs on environment relationships’ with 76% of participants giving a positive or very positive response in this category. A similarly positive response by participants to the art had led them ‘to reflect on environment relationships’ with 77% giving a positive or very positive response in that category. Such reflection would, arguably, require at least a cursory review of some personally held attitudes and beliefs. In terms of specific environmental knowledge acquisition, which might either help confirm, affirm or challenge existing beliefs or attitudes, the strongest participant responses were in the categories ‘impacts of coal mining’(71% positive or very positive response) and ‘value of nature refuges’ (71% positive or very positive response).

The most frequently recorded, a priori language code recorded in interview, and as listed in Table D5 of Appendix D (red code CI) was: ‘recognition of environmental

information communicated and possible reflection upon it.' The communication of environmental information was also evident from verbatim participant commentary:

> Well for a start I didn't know the diversity of the Bimblebox Refuge – so I found out more about that. I have already been involved with thinking about mining because there was exploration here in my home area. It just really compounded my feeling about, you know, the wrongness of going ahead with that sort of development. Especially in the face of climate change, you know we should be preserving those pockets of diversity that we have because they are rapidly disappearing. (Research participant comment taken from transcript, 02 2017)

> The exhibition has definitely educated me about that specific area (Bimblebox Nature Refuge). I wasn't really aware of what was happening there - even though I was born in that State. It educated me – and stepping back, it solidified my opinion that we need to look after our environment better than we are.' (Research participant comment taken from transcript, 02 2017)

Both of these comments suggest that participant knowledge acquisition from the Bimblebox art lead to some review of environmental beliefs and attitudes; and that, for some participants, experience of the exhibition consolidated and extended an existing level of pro-environmental awareness and motivation on the issues the exhibition represented. The implication of this finding is discussed throughout thesis section 5.1. The list of participant verbatim comments in Appendix E add further qualitative evidence of the strength of participant perception of exhibition artwork influence upon them in a variety of ways.

4.4.4 Influence of the exhibition on worldviews and pro-environmental behaviour

The present study assessed whether experience of the Bimblebox art had had any influence on environmental worldview values and pro-environmental behaviour profiles of participants taken at three sampling points across the 12-month longitudinal research period. In terms of participant environmental behaviour profiles, question 6.1 of Survey Part A asked participants whether they had performed a range of 14 pro-environmental behaviours: 'often'

'sometimes' 'occasionally' or 'never' at each sampling point, The question covered a range of pro-environmental behaviours (PEB), from recycling and energy efficiency practice, to involvement in local government decision making, and political protest over an environmental issue. A simple 'Green-Brown' PEB continuum scale, depicted in Figure 4.2, was developed from numerical scoring of the frequency of performance of the behaviour categories for each participant, and a mean percentage score (Mean PEB score) was then calculated for each participant sample cohort. The latter data are provided in Table 4.1.

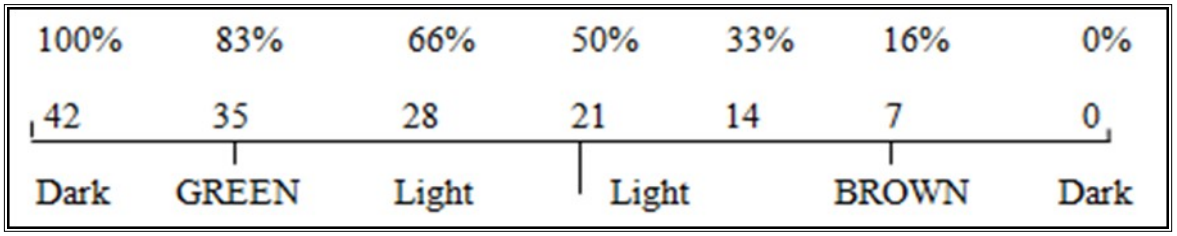


Figure 4.2: Green-Brown continuum for categorising PEB scores

Inspection of the PEB frequency data in the last column of Table 4.1 reveals the mean score for the pro-environmental behaviour profile of the research population as a whole, at baseline survey, was 69%.This light to mid-Green positioning on the scale in Figure 4.2 aligns with the discussion on the probable pro-environmental skew in demographic characteristics of the research population described earlier in this chapter. The findings in Table 4.1 also revealed that certain cohorts differed substantially from the mean PEB value for the overall sample. For example, the age 26-35 cohort was below the PEB mean for the sample whilst, perhaps unsurprisingly, the contributing artist cohort score was well above.

Notwithstanding the heterogeneity of different cohort PEB frequency scores it was anticipated that there would be little or no significant difference observable in the PEB scores of individual participants across time. This expectation was based on an assumption that an existing profile of habituated behaviours would not be expected to change greatly over a comparatively short, 12-month period, albeit under the influence of environmental art.

A mean PEB score was calculated for the participant population responding to Survey Part A question 6.1; on the environmental behaviours they had performed in the preceding period at all three survey points. The results confirmed that there had been little change in these scores across time. The respective figures obtained for mean population PEB scores were 68.5 at baseline survey (n=59), 67.1 at the 6-month sampling point (n=66) and 66.6 at the 12-month sampling point (n=51).

Similarly, it was anticipated that the environmental worldviews of participants, which are based, as suggested in the research literature (Dunlap & Van Liere, 2008) upon their habituated and enduring beliefs and attitudes, would be unlikely to change fundamentally as a result of artwork exposure over a relatively short time period of 12 months. The findings for this category of art influence are contained in Table D3 of Appendix D, which also compares PEB profile scores with worldview across the three longitudinal sampling points. One notable feature is the predominance of the 'environment is fragile' worldview held by the research population (see the first column of Table D3). This accounted for 88% of the research population at baseline survey, and did not change substantially across the 12-month period after varying sample sizes and cohort participation changes were taken into consideration.

Table D3 also reveals a strong association of Green PEB profile scores (78% of all scores) with a fragile environment related worldview. Again, there appears to be a continuity of this association across the three sampling points. The reduction in Green PEB profile participants holding a fragile environment worldview at the 12-month sampling point (66%) could be explained, in part, by the non-survey of the 17 artist and curator participants in the research. They were involved in key informant interviews for another aspect of the research at that point; and the artist cohort (n=11) had represented higher PEB scores and above average, fragile environment worldview profiles in earlier rounds of survey.

4.4.5 Influence of the exhibition on emotional response

In Table 4.6 the relevant data categories relating to this component of possible art influence are covered in the rows dealing with ‘strength and valence of emotion’ and ‘type of emotional response.’ Participant answers to Survey Part A, questions 4.3. to 4.5, which dealt with emotional experience, showed a notable effect of participants being moved emotionally by the exhibition (a 68% positive or very positive response) and this was reported as a strong experience for many (a 59% positive or very positive response).The types of emotion experienced were identified as anger or indignation, despair or joy, excitement or awe. The emotional valence experienced by the majority of participants was strongly negative overall, with 83% of participants giving a negative or neutral response for emotions named predominantly as ‘anger’ frustration’ ‘anxiety’ ‘despair’ and ‘sadness.’

An example of negative emotional response is given by the following participant quote which cites despair in an expectation that the emotional reach of the Bimblebox exhibition would be limited:

> The despair of knowing that the bulk of the population will not be reached by the other emotions on offer to those who delve into the exhibition and what it means in context to the physical reality of the nature refuge itself. The loss of a thing of beauty that is overlooked by most and derided by some; the Desert Upland ecosystem and the bulk of "outback" Australia. (Research participant comment taken from Survey Part A, 06 2016)

There was also a minority of participants (n=6, 12%) who expressed positive emotion in their responses to the Bimblebox art. Most frequently these expressions occurred in the context of a mixed emotional statement such as ‘sadness, anxiety and a little bit of joy’ or ‘fear of the future; admiration for the artists.’ A good insight into this emotional mix, its link to possible cognitive dissonance within the participant, and recognition of the social norm

influence by the exhibition contributing artists is given in the following comment:

> Whilst hope was my underlying emotion, there were moments of anxiety and frustration and anger and joy. Anger at government and company greed, and anxiety at potential losses,
> not just at the nature refuge, but the wider implications of groundwater contamination; and joy that there are people who are brave enough and talented enough to give us hope in saving
> the refuge. (Research participant comment taken from Survey Part A, 06 2016)

These findings were further augmented by the results from qualitative language coding of participant interviews. The second most frequent emergent code, reflecting participant experience of the power of art to communicate through emotion (green colour code 4PSY in Table D5, Appendix D) was a clear demonstration of the psychosocial factors operating at emotional and sub-conscious levels within art audiences. Such positive or negative psychosocial influence mechanisms (Fredrickson, 2004; Lertzman, 2012; Seligman & Csikszentmihalyi 2014; Weintrobe, 2013) are some of the least researched elements within the already sparse literature on environmental art influence; albeit they may be some of the most important elements for future research to explore because of their ability to affect the quality of cognitive reasoning and therefore engagement in

audiences, an issue discussed in Chapter 5.

4.4.6 Influence of the exhibition on habits

The ‘awareness of the force of personal habit as it may influence pro-environmental behaviour in positive or negative ways’ was one of the bottom three frequency rankings of a priori language codes listed in Table D5 of Appendix D (red colour code HAB). Interestingly, force of personal habit as a driving factor in pro-environmental behaviour was cited as a significant influential component by Curtis, et al. and Klöckner but achieved a low ranking in this present study. In retrospect, the survey design of the present study did not probe explicitly for habitual behaviour, and therefore almost certainly under-recorded its incidence and effects in the research population. This probability is also consistent with the largely

unconscious and routine nature of much habitual behaviour (Verplanken, 2011; Pine & Fletcher, 2014).The functional value of habitual behaviour is that it allows us ‘to perform routine actions with a minimum of deliberation and often only limited awareness’ (Jackson, 2005, p114).

4.4.7 Influence of the exhibition on intention to adopt pro-environmental behaviour

The extent of environmental art influence on future intention to act in pro-environmental ways was a key topic of interest in this research. The importance of intention as a precursor to tangible, pro-environmental behaviour is recognised within the environmental psychology literature (Bamburg & Moser, 2007; Klöckner & Blöbaum, 2010). It is also represented centrally in Klöckner’s 2013 model as used in this research (see Figure 1.1 in Section 1.3). Due to concern over avoiding a possible leading question I did not ask participants if the exhibition had made them intend to change their behaviour in specific ways, but left this question more open. In Survey Part A, in the second text box of question 6.2, I asked participants to comment about any ‘future environmental activity or intentions for environmental activity you may have at this time after having interacted with or seen the Bimblebox exhibition.’

Although it was not possible to perform statistical significance analyses on participant responses given the generality of this question, the answers given indicated a clear pattern as described in Table 4.7. Respondents’ reported levels of motivation or intention to undertake pro-environmental behaviours (PEB) subsequent to having seen and responded to the Bimblebox artwork, rose from 57% of the baseline survey population recording a written response to this question to 61% at the 6-month sampling point; and increased to a peak of 64% of the population recording a comment to this question at the 12-month sampling point. These quantitative frequency figures must be treated with caution due to the effect of varying

Table 4.7: *Participants stating PEB intention to act after viewing Bimblebox artworks*

Survey Round	Participants stating intention to undertake PEB		
Baseline (within 2 months of seeing the Bimblebox artworks	n= 79	45	(57%)
At 6 months from baseline	n= 57	35	(61%)
At 12 months from baseline	n= 39	25	(64%)

levels of participant recorded response and population sample sizes at different sampling points. For example, participants who responded to this survey question numbered 79 at baseline survey, dropping to 57 participants at the second round, 6-month sampling point and 39 at the final round 12-month sampling point. The final sampling point also excluded 17 participants, from the artist and curator population cohorts, as they were taking part in other surveys.

Notwithstanding these caveats, this quantitative data coupled with the previous finding that exhibition experience had led 77% of research participants to reflect on their existing environmental behaviour (see Section 4.4.4).These findings did point to perceived influence of the Bimblebox art onto the pro-environmental motivation, conscious intentions or actual behaviours of over half of the research population; and that influence was maintained across a 12-month period. When qualitative scrutiny was brought to bear, on written participant responses from survey and transcribed interview comments, this probability was further strengthened. For example, in response to Survey Part A question 6.2 at baseline survey, one research participant wrote down the following intentions:

> Make more effort to not use plastic bags when buying food. Look again into solar energy storage and usage. Attend Landcare working bees. (Research participant comment taken from Survey Part A, 06 2016)

When questioned in more depth about these responses in a subsequent semi-structured interview it became clear that this participant had prior environmental motivation

and behaviours around each of the three intentions noted. It seemed possible, therefore, that, in this case, experience of the Bimblebox artworks had had a framing or priming effect on this participant. The strength of this reinforcing effect was revealed, for instance, in relation to prior financial constraints acting on the participant's consideration of domestic photovoltaic panel installation, as was explained in interview:

> It's been an economic thing for us, but I'm now going to look at that again, and say the cost to the environment is just too high and it doesn't so much matter about the dollars…and this will be a hard one to step up to because we haven't got that much. (Research participant comment taken from interview transcription, 07 2016)

At the 6 month and 12-month data collection time points, some research participants gave qualitative interviews responses which indicated that they had carried out actual behaviours which they clearly associated with their original, baseline intention to act in pro-environmental ways as a result of experiencing the Bimblebox exhibition. These behaviours ranged from undertaking budget research on domestic photovoltaic panel installation, consciously changing certain work practices in business operations, and attending anti-mining public protests. In Appendix E a total of 47 participant comments, either written in text box responses within Survey Part A or extracted, verbatim, from interview transcripts across the 12-month research period, revealed a wide range of motivations and future intentions for PEB which participants associated with their experience of the exhibition. Perhaps unsurprisingly, comments related to coal mining impacts figured most often; and in turn, those comments seemed to be associated with a number of intentions related to future domestic energy saving suggesting that some participants were making the link between energy generation and coal mining and combustion from previous knowledge.

A few of the comments in Appendix E reveal a more diffuse influence of artwork experience, causing the participant to review aspects of their pro-environmental behaviours

not immediately connected to the specific issues concerning the Bimblebox Nature Refuge. Equally, the qualitative, emergent language codes; those not adapted directly from the theoretical models of Curtis and colleagues (2014) and Klöckner (2013) but rather generated from interview transcript data and researcher memos, offered further insights into the factors affecting art influence on research participants. For instance, the green coloured emergent codes, compiled in the bottom half of Table D5 in Appendix D, demonstrated the importance of the way participants make sense of and draw meaning from art practice (green colour code 2 AIA); the value of emotion as opposed to cognition in regard to such meaning making (green colour code 4 PSY); and the synergy between the existing belief and attitude systems of participants, and the visual frames offered by the art (green code 13 GMI).The implication of these findings is discussed in Section 5.1.1.Taken as a whole, these various strands of findings support the probable influence of environmental art on diverse pre-cursors of audience pro-environmental motivation, intention or behaviour.

A final finding relating to stated intention to act in pro-environmental ways across time concerned that cohort of the total baseline population who had changed their motivation regarding PEB intention during the 12-month survey period. Of the 64 research participants who were surveyed at least twice during the research, 72% retained their stated baseline stance on having an intention or no intention to change PEB. Of the remaining 28% of the sample, a majority had moved from a position of stating no intention to change PEB at baseline, to a stated intention to change. This result could be interpreted as indicating the presence of a longitudinal reinforcement effect on to pro-environmental intention as influenced by the Bimblebox art, and this possibility is considered further in Section 5.1.1.

4.4.8 Other influences of the exhibition found in emergent language coding

Other emergent language code data (green colour coding) compiled in the second half of Table D4 of Appendix D provided further insights into the responses and concerns of the

research sample not so obviously captured by the theoretical models. For example, the most frequent emergent language code reflected an interest amongst participants in finding the right balance between the experiential and educative aspects of artwork influence. Participants were concerned with the balance between appreciating the artwork as a whole and using its didactic interpretation (green colour code 2AIA). This finding did seem to go to the heart of an important issue: of what meaning is derived from art by audiences, and therefore what educative and engagement influence attaches to art practice. There was an associated thematic concern here: to ensure that art is as openly promoted, accessible and intelligible to as wide a circle of the public as possible. This concern was associated with overcoming any tendency for art to be considered partisan, elitist or obscure. The distributional power and user autonomy promised by digital technologies, as described elsewhere in the thesis, came to mind in regard to addressing some aspects of this particular research population response theme.

The third most frequent emergent language code reflected the power of art imagery to reinvoke or re-enforce pro-environmental thought patterns (green colour code 1 GMI); and this finding aligns to the increasingly important research field on the power of visual 'framing' of sustainability concepts. We now live in a predominately visual and image saturated digital culture in which the relevance of 'what works best' as regards visual framing influences on audiences is being increasingly explored (O'Neill & Smith, 2014; Corner, Webster & Teriete 2015). This issue is considered further in Section 5.1.3

4.5 Research Question 2: Software and Digital Art Dissemination

I begin with the findings derived from the Bimblebox research population itself. This included the positive and disproportionate response to the mobile software application or app, entitled simply 'Bimblebox' that was designed as a companion to the paper and pdf distributed exhibition catalogue. A representation of a screenshot from the app is given in

Figure 2.2.Within the research population, 33 participants reported they had downloaded the app. Surprisingly, this figure represented approximately 14% of the total number of exhibition audience acquisitions of the app recorded to have occurred across the period covered by this research; that is, about 250 digital downloads (Greg Harm personal communication, 04, 2107). The availability of the app did not match the duration of the physical exhibition exactly over its touring life. Even making an adjustment for that discrepancy it is clear, however, from a comparison of the number of total downloads with the recorded number of visitors who viewed the physical exhibition, that take-up of the software across that national audience was probably very low, estimated at less than 1.0% of the total visitor population of over 45,500 individuals.

The minimal use of the Bimblebox app in terms of potential public sustainability engagement aligns with other quantitative findings in this research as depicted in pie charts two and five in Figure 4.1. It is clear that the current research population had a low frequency of use of art-related apps generally over the previous 5-year period, with 64% of the population reporting no use, and less than 20% reporting more frequent use. When exploring the use of art oriented apps within the research sub-sample groups of artist, curator and audience member it was interesting to note that the latter group had the greatest experience, of 50% of total app use over the previous five years.). At first glance this result seems somewhat counter intuitive and it would have been interesting to carry out further research to clarify the reasons for the lesser rate of app use by artists and curator groups.

Notwithstanding the low overall take up of the Bimblebox app external to this research; those research participants who accessed it within the study were highly positive about its use. As detailed within Table 4.3, 88% of participants who accessed the app recorded a positive or very positive response to it. A comparison was made between the various aspects of the exhibition experienced by participants and their stated intention to

change their pro-environmental behaviour in some way. For that cohort who saw the app, 73 % reported at baseline survey an intention to change their pro-environmental behaviour (PEB) in some way as a result of experiencing the exhibition.

This level of future PEB intention for those who saw the app was as high or higher than the levels reported for other cohorts who accessed different elements of the exhibition – such as attending an associated workshop or activity (62%), viewing a printed or digital brochure (60%) or even viewing the physical exhibition itself (53%).The structure of the quantitative survey did not allow the influence of the app on participants to be considered separately from the influential interplay of other exhibition elements. However, these findings do suggest a value-adding effect from both the human and digitally facilitated presentation of environmental artworks; that is, over and above the public sustainability engagement potential of exhibited art standing alone. The potential of the digital technology form of value-adding is discussed in thesis Section 5.2.

The quantitative findings described here aligned with some reported comments of participants taken from qualitative survey. The quote below typifies a number of themes mentioned by other participants. It describes a valuation of the Bimblebox app, both as a compelling source of information in its own right, as an aide memoire, and as interactive extension of the physical exhibition:

> I loved the app, it was really good going back and forth to compare with the catalogue artworks and flicking between the images of the app, and it was easy to use. I used it to get an understanding of the meaning of the artworks. I thought it was a great way of presenting art. I guess in the comfort of your own home you can look whenever you want to, when you are ready and in the right frame of mind, if you want to call it that. I could just sit down and go through it at my own pace, which is a little bit harder for you to do with a physical exhibition. You don't necessarily want to come back in that case, yes, I definitely thought it was a good thing (Research participant interview, 20th January 2017).

A small number of participants who saw the app were not so convinced of its value,

typically citing difficulty of navigation of the individual ‘pages’ of the software; and for some the interactivity provided by the app did not go far enough. For them, it was not, ‘game like’ enough, and was not as environmentally informative as it might have been:

> I looked at the app and the catalogue and I found that the app was a little hard to navigate. I think the best use for apps is when there is an interactive element. You know, if there had been a poem and you were asked to complete certain lines of verse, or a song which you were asked to add lyrics to, or something like that. When the app is, in fact, just a version of the catalogue for art pieces, I’m not so sure that works so well. We need to do things like this at a higher level of sophistication. For example, including something that could remind you about the state of cleanliness of the environment or something like that (Research participant interview, 15th August 2016).

4.6 Research Question 3: Role of the Museum Sector in Sustainability Engagement

A small group (n=10) of Bimblebox exhibition contributing artists and associated museum and gallery curators were surveyed as key informants in the final survey round of the research. A resources essay: ‘Where to from here?’ (reproduced in Appendix C, Figure C4) was supplied as stimulus material to these research sub-sample cohorts based upon the adult Study Circle model for eliciting subjective participant responses (Larsson & Nordvall, 2010). The essay carried several propositions derived from the case study research. The main one was that it was probable that putting more environmental art, more frequently, into more museum and public spaces, both virtual and online, could make a considerable future contribution to the development of a more pro-active, environmentally and scientifically literate civil society.

A semi-structured questionnaire (see Appendix C, Table C1) was used to guide the discussion with informants and was framed around the ‘sustainability intersection’ concept developed by the researcher, as previously mentioned. The proposition drawn for this concept is that the public sustainability engagement resource embodied within environmental art practice could be used more effectively if it was matched, more systematically, with the

collections, research and public educational expertise of the museum sector; and if it incorporated, regularly, the presentational and engagement pull of an existing and emerging digital technology spectrum.

From their introductory comments it was clear that each of the artists and curators interviewed accepted the main proposition in principle; but individual informants differed in their assessment of the progress being made toward their achievement in Australia, and offered some caveats in that regard. This was particularly the case with regard to the adoption of digital technology. There was some concern about how this could be resourced and incorporated in a well thought through and integrated way; and in an era of steadily eroding public funding for art practice and the museum sector in Australia. Informant comments were condensed under a number of thematic headings and the similarities and differences occurring across the curator and artist sub-sample responses can be seen in short report format, at Appendix D on p.198

4.7 Summary

The findings described in this chapter have contributed to providing answers to the three research questions posed at its commencement. The results from the mixed method, quantitative and qualitative surveying of the Bimblebox exhibition research sample aligned to confirm the existence of several factors of environmental art influence operating to affect pro-environmental motivation, intention or actual pro-environmental behaviour (PEB) in over half of the research population. The various tables in this chapter revealed strong participant responses across a number of categories of art influence, suggesting that (from Table 4.6):

- They learnt about environmental issues (81% of research participants said it had this effect on them);
- They had their environmental beliefs affirmed (76 % of research participants);

- It assisted them to reflect on human-environment relationships (77% of research participants confirmed this).

Other reported effects of the Bimblebox exhibition, listed in Table 4.6 were that:

- It educated participants on the impacts of coal mining (71% of research participants);

- It educated participants on the value of nature refuges (71% of participants);

- It moved participants emotionally; and predominantly in terms of negative emotion such as sadness, anxiety, anger and despair (68% of research participants);

Equally, experience of the exhibition resulted in a participant perception that sharing images of the artworks on social media would be a good way to bring the Bimblebox art, and the issues it represented, to a wider audience. A majority of participants were positive or very positive that such image sharing would make other people aware of the importance of related nature conservation issues; and the value of supporting NGOs and activist campaigns to reduce dependency on coal mining. (64-70% of participants).

This corroboration of some components of theoretical models of pro-environmental art influence was also reinforced in other ways. The Bimblebox research population showed several similarities in terms of environmental art influence on PEB when compared to some of the very few, recent case studies which have explored such influence. These included the possibility of a relatively low initial motivation to attend environmental art presentations, per se; but the significant subsequent levels of influence of that art upon audiences who did attend, regardless of their initial reason to view the art.

Equally, there was the finding of a significant level of baseline and maintained influence exerted by the Bimblebox exhibition art across the entire research population. This influence was found to have occurred irrespective of the initial PEB scores and profiles of research participants; and this finding validated results from earlier published research which

suggested that environmental art has the ability to exert a ‘twin track’ pro- environmental influence on people with both high and lower initial levels of baseline pro- environmental behaviour. Taken together, these various findings supported the corroboration of some theoretical mechanisms of art influence occurring within the research population who experienced the Bimblebox exhibition artworks.

Research question two was answered in the affirmative by bringing together the findings from the Bimblebox exhibition research population response to the mobile software application designed to present the art of the exhibition; and the findings from published literature review on the art-oriented applications of a still emerging digital technology spectrum. These joint findings pave the way to consider an important future role for digital technology to enable more compelling and engaging public experience of environmental art.

Finally, research question three was addressed in part by the findings based upon the perceptions of a small cohort of Australian environmental art, museum and gallery practitioners. These pointed to the strengths and opportunities, as well as the challenges and constraints acting upon triple bottom line sustainability adoption for that microcosm of environmental art and museum practice; as well as the potential for the two sectors to work more synergistically, and incorporate the digital technology presentation of art. Many of the themes revealed by the key informants were consistent with those occurring in the wider environmental art and museum literature, which documents many of the same issues and challenges being experienced internationally.

In Chapter 5 to follow, I discuss the alignment of the findings from this research with the academic literature, provide a final, strong affirmation of the research questions under scrutiny, and explore some of the implications of the findings from this study for future public sustainability engagement through environmental art.

CHAPTER 5: Discussion

Introduction: This chapter has the following three aims:

(1) To discuss my affirmative answers to all three research questions described in Table 3.1 in the light of the research literature mentioned throughout the thesis.

(2) Using this discussion, to determine whether my findings provide insights into the research problem of the environmental attitude-action gap[4] introduced in Section 1.1.

(3) To draw out implications from my work for a future enhanced role for environmental art advocacy in public sustainability engagement.

5.1. Verification of Environmental Art Influence on Pro- Environmental Behaviour

5.1.1 Summary of findings

As described in Section 4.4, findings from the research sample used in this study pointed to a strong participant perceived influence of the Bimblebox art onto their pro-environmental motivation, conscious intentions or actual pro-environmental behaviours. This influence affected over half the research population and was maintained across a 12-month period.

Those findings align well with and affirm some of the original artistic objectives of the Bimblebox exhibition itself. One of these was to focus public understanding and concern on the potentially destructive impacts of coal mining on the Bimblebox Nature

Refuge and wider Galilee Basin region. Another, was to stimulate greater public empathy and protection of the Refuge site by creating a place story of its natural world values through art (Bimblebox Exhibition, 2016; Bimblebox Art Project, 2016). The present findings suggest that the exhibition very probably succeeded in achieving those objectives with a significant proportion of the audience who viewed it.

[4] Defined here as the disconnect between what we know, scientifically, needs to be done to halt and start to reverse global environmental deterioration; and the inadequate, practical response to this global challenge that has occurred to date.

5.1.2 The alignment of present findings with theoretical models and other published findings.

Behavioural models.

The results on perceived cognitive and emotional influences of the Bimblebox art on participants subsequent to baseline survey as described in Section 4.4 were consistent with and verified several of the components and mechanisms of art influence proposed in the published theoretical models of Klöckner (2013) and Curtis, et al. (2014) used comparatively in this study (see Figure 1.1). For example, in regard to participant awareness of consequences through communication of information, through participant self-ascription of responsibility for some of those consequences, through social norm influence, by influencing participant beliefs and attitudes; and through influence on intention to engage in pro- environmental behaviour.

Furthermore, some of these same components of influence found in the Bimblebox exhibition sample have also been described as influential elements within earlier theories of pro-social and pro-environmental behaviour change (Jackson, 2005). For example, in relation to the significance of relevant environmental information that is communicated to individuals (Kennedy et al., 2009) and in relation to the mechanism of social norm influence which can operate by 'simply bringing to light the true levels of desirable pro-environmental behaviour among others'(Griskevicius, Cialdini, & Goldstein, 2008).They have also been reported in some of the rare examples of research that have explored specific environmental art influence on the components and mechanisms outlined (Marks et al., 2016)

Intention to act in a pro-environmental way has been described as a crucial pre-cursor to actual pro-environmental behaviour in theoretical models such as Klöckner's, where it is claimed to have a power to 'mediate the impact of all other psycho-social variables on pro- environmental behaviour' (Bamburg & Moser, 2007).In the case of the Bimblebox

exhibition research sample, the baseline level of reported intention to act in pro-environmental ways actually increased in that cohort of the sample which was surveyed on at least two occasions across a 12-month period. Some of this increase may have resulted from a reinforcement of participant thought processes about exhibition artworks caused through repeat surveying. This possibility was supported by some participant comments from qualitative interview taken at the 12-month sampling point.

Such a mechanism of reinforcement would be consistent with those of iterative learning cycles in adult education models as exemplified in Kolb's experiential learning cycle (Kolb, 1984). These data also suggest a probable, independent continuity of effect of artwork influence on intention to engage in pro- environmental behaviour being maintained across a 12-month period. This finding was associated with the fact that 9% of the participant population reported engaging in actual pro- environmental behaviours which they perceived as being directly associated with their experience and recall of the Bimblebox exhibition artworks. This finding could also point to the possibility of initial cognitive and emotional stimulus by the Bimblebox art, followed by habituation of subsequent reflective thought leading, ultimately, to tangible behaviour in participants.

These results align with findings from earlier environmental psychology research. For example, one study (Matthies, Klöckner & Preißner, 2006) proposed the enduring power of personal environmental motivation and effects on behaviour generated predominantly through personal or social norm influence. It was also proposed that this effect is particularly strong when such influence is combined with the presentation of the negative environmental consequences of human behaviours; and further aided by ascription of personal responsibility for those consequences. These were some of the very elements reported by participants as having been influential for the research population in terms of its experience of the Bimblebox artworks. In the case of environmental art influence, Marks and her colleagues

also found social norm influence to be an important factor operating upon the audiences for a public art festival (Marks, 2016).

Studies on the influence of environmental art

A comparison between the present research findings, and the few examples of research found in literature review that explored specific environmental art influence on participants, also helped build a case that the former could help validate the results from published studies. In Table 5.1, various Bimblebox research findings taken from Chapter 4 are tabulated against the findings from three other studies on environmental art influence where a broad similarity of questioning allowed a comparison to be made.

Table 5.1: *Other influences of the Bimblebox exhibition on research participants*

Statements or Items	Overall number	Bimblebox participants who recorded a positive or very positive response		Comparative findings from other studies asking similar questions about art influence					
				Curtis et al.,(2007)					Marks et al., (2016)
				MP		AE			
	N	n	%	N	%	N	%	N	%
Knowledge gained about environmental issues	77	62	81	96	43	46	28		
Participant reflection on environmental relationships	76	59	77	168	74	47	62		
Affirmation of beliefs held on environmental relationships	75	57	76	167	59	46	61		
Emotional effect of art experience	76	52	68	169	73	46	46		
Exposed to new ideas through art	78	40	51	167	31	46	35		
Intention to change pro-environmental behaviour	79	45	57	170	67	46	50	120	41

Note: The first column of percentages given for Curtis et al., (2007) refers to the influence of a dramatic musical performance on audiences (MP). The second column of percentages given for Curtis is for audience response to a public art exhibition (AE).

In 2007, Curtis explored the capacity of performance art to affect environmental education outcomes with audiences and communities (Curtis, 2007). This research contained a case study which examined the influence of an ecological themed, oratorio musical performance on audiences (n= 170) and recorded a figure of 67% for stated individual intention to change environmental behaviour to some extent (Curtis, 2007). Another case study drawn from the same 2007 research explored the influence of an environmental art exhibition which had natural resource management community capacity building objectives within its brief (Curtis, 2007).

Participants in both the Curtis case studies were asked whether experience of the artistic musical performance and the art exhibition had affected their reflection on the human relationship with the natural environment; and whether it had affirmed beliefs about that relationship. The frequency figures obtained were 74% and 59% of the total sample, respectively. The comparable findings categories in the Bimblebox baseline quantitative survey (see Table 4.6 and 5.1) returned figures of 77% and 76% of the total sample, respectively, suggesting some degree of similarity of art influence. In Table 5.1 there are also categories of art influence in the present research that had some comparability to the earlier survey work of Curtis. Two examples are the emotional effect of art on participants, and their perception of being exposed to new ideas through art. Here, comparability of art influence seemed less clear, with the Bimblebox exhibition results placed either above or below the percentage frequencies found in the other studies.

Another study, by Marks and colleagues, explored audience response to environment themed installation art at a local festival. One survey question in that work asked participants if they intended to change their environmental behaviour as a result of attending the festival. The findings reported were that 41.0% of the visitors surveyed (n=120) stated an intention to change their subsequent environmental behaviours in some way, 43% stated no intention,

and 16% of participants gave no indication either way (Marks et al., 2016).

There are caveats on any inferences to be drawn between the present study and the other three cited. For instance, there were differences across the studies in how survey questions linked to art influence effects were framed with greater or less specificity. Equally, three genres of environmental art presentation quite different to that in the Bimblebox case study were under scrutiny. Those differences make direct comparison across the three studies impossible. It is interesting to note, however, that some of the percentage figure comparisons for art influence were quite close across some categories of influence.

On the other hand, the level of surveyed art influence on pro-environmental intention within the Bimblebox art exhibition population at baseline survey fell about midway across the range of similar category results within the other studies described. These comparisons suggest at least a possibility of some commonality of art influence effects occurring across the studies, but also a possible continuum of intensity of environmental art practice influence; in so far as public sustainability engagement is concerned.

The 2007 study by Curtis with its case study comparisons of similarities and difference in audience responses to several different types of environmental art genres, including musical, dramatic performance and exhibited art, pointed to such a possibility. One hypothesis put forward in that study was that public response to environmental art may be mediated by the quality of the art created and the community expertise involved in its presentation (Curtis, 2007).In that context it is interesting to note that several participants within the present research commented on the artistic quality of the Bimblebox exhibition, particularly when considered as an example of community based, collaborative art practice.

Valuable past research has explored the application of earlier forms of environmental art and art-science genres to community-based science communication, natural resource management and environmental remediation projects (Curtis et al., 2012; Ingram, 2012; Reid

et al., 2005). With the recent Anthropocene inspired call for new resources to facilitate public sustainability engagement, this past work will form an excellent base from which to further explore the specific characteristics of environmental art influence. It will be important to develop more specific knowledge about what renders different forms of environmental art presentation more or less compelling and effective in fostering hands-on engagement by the public with sustainability issues. As an example of the extension of earlier research, an interest in 'what works best' for environmental art presentation to engage the public is now emerging from within a new research field. This field is exploring the significance of environmental cognitive framing within visual and artistic presentation to influence and engage the public on sustainability issues. This work seemed pertinent to the present study and I now go on to consider some implications of recent published findings to my own.

5.1.3 Alignment of findings with visual framing and priming research

In Chapter 2, I used the concept of 'frames' to consider some different ways of thinking about and characterising the nature of the Bimblebox exhibition. In the wider research literature, a frame has been defined as a typically unconscious structure sometimes also called a 'schema' (Lakoff, 2010) which is composed of belief systems or mental models. In turn, the latter provide 'interpretative storylines that communicate what is at stake in a societal debate and why the issue matters' (Nisbet and Schefeule 2009).

Recent research by O'Neill and her colleagues offer some insights into how the frame concept has relevance to environmental art influence. Their work explored the public environmental engagement potential of the static art genre of photography, as applied to the representation of environmental issues in climate change communication (O'Neill, et al. 2013; O'Neill & Smith, 2014). This work has shown there is often a distinct difference in the form of environmental influence achieved by different types of photographic image.

There are images that are immediately engaging or 'salient' in making the viewer believe that an issue such as climate change is important. In contrast, there are other images that possess 'efficacy' or the ability to make the viewer feel they can actually do something about climate change. According to O'Neill, these two categories of influence are often mutually exclusive. Additionally, visual imagery of all kinds is well known to be able to 'prime'[4] a viewer toward thinking or feeling something by a process of mental association in the mind of the viewer (Jackson, 2005). In combination, such findings are now contributing to the 'what works best' debate on environmental art influence. For instance, in assisting a search for the most effective photographic imagery in communicating climate science concepts, and to actively engage the public with other forms of artistic imagery for the same purpose (Corner, Webster & Teriete 2015; Shaw & Corner, 2017).

Returning to the findings on artwork selection by participants in Section 4.3.3, and reflecting on them in the context of frame theory, I hypothesise that the top-ranking artworks selected by participants would be those which evoked existing, well-formed, environmental or symbolic conceptual frames in the minds of the viewer. As previously described, the research population overall was probably strongly pro-environmental in terms of its baseline PEB scores. Given that fact, it might be expected to carry, individually and collectively, a considerable number of ready-formed, environment-oriented frames because in the past 'the general message regarding the environment had been well sold' to this population (Kennedy, et al., 2009).

In alignment with this reasoning I propose that the recent findings on frame concepts, salience and efficacy in photographic art influence could be extended to the related genres of exhibited pictorial and installation art, as contained within the Bimblebox exhibition. One

[4] Priming in this sense can be defined as a memory effect in which exposure to a visual stimulus, such as art imagery, can influence response to a subsequent, different stimulus e.g., consumer behaviour

interesting area to explore in any future research on exhibited environmental art engagement of the public might be on the alignment and compatibility of existing, audience environment-oriented frames, and those embodied in the artworks themselves. The latter represent the original framing of the issues of concern by the artist themselves. The interaction of audience and artist cognitive and visual framing may go some way to explain the reported differential audience experience of artworks in the exhibition as discussed in Section 5.1.4. This interaction may also help illuminate the mechanism of what I discuss in Section 5.1.5 as a twin track path of art influence on research participants.

5.1.4 Insights on Bimblebox artworks engagement using visual framing research

Following on from previous reasoning it might be expected that many participants in the present research would have had at least a general idea of the connection between coal mining and its deleterious impacts prior to baseline survey. Some evidence for that supposition comes from the range of coal related participant comments given in exhibition external visitor book commentary, and through survey in this research, as listed in Appendix E. Due to the prior cognitive framing and interpretive sustainability storylines held by participants (which I hypothesised in the previous section) they might be expected to pick artworks, preferentially, in terms of the ease of immediate meaning they could make of the art. In turn, this choice would be based upon their existing environmental frames, and the associated emotions and metaphors that were elicited, by the art, in relation to those frames. The end point of this process would represent, in O'Neill's terms, the salience or immediate impact of the artwork.

Based upon the participant comments presented in Section 4.3.3, the two most often chosen Bimblebox artworks, *15 endangered black-throated finches,* and *Coalface* (listed in

Table 4.5 and depicted in Figure B1 of Appendix B) both, arguably, demonstrated operation of salience and efficacy phenomena (O'Neill, et al. 2013; O'Neill & Smith, 2014). To use O'Neill's terminology, these two named artworks were clearly 'salient' in invoking strong responses from their viewers.

On the issue of efficacy of the Bimblebox art, the findings are less clear. An initial assumption, that the most selected works would show more influence on participant reported intention to act in pro-environmental ways, was not borne out. A statistical test revealed no likely correlation between the number of times a work was selected for the initial audience impression it had made (salience) and a stated intention to act in pro- environmental ways at baseline interview from participants (efficacy). A Pearson Correlation 2-tailed test returned no statistically significant correlation between these variables. (Pearson correlation coefficient =.094, n= 58, Sig (2-tailed) =. 494, $p < .05$).

In Section 4.3.3 the participant ratings of importance of social media sharing of images of the artworks, for informal environmental education or advocacy purposes, also showed no statistically significant correlation with the salience of the works in terms of frequency of selection (see Section 4.3.3). Taken together, these results suggest that there was indeed a divergence between image salience and public engagement efficacy effects operating for participants in relation to individual Bimblebox artworks. This finding seemed to validate the phenomena noted by O'Neill, albeit given the caveat that a different genre of environmental art was under scrutiny in that research (O'Neill et al., 2013; O'Neill & Smith, 2014).

Another finding, obtained from the qualitative language coding data of the present study, lends further support to the possibility of visual framing and priming influences operating within the research population. The third most frequently identified language emergent code, that is, one not adapted directly from the theoretical models of Curtis and

Klöckner, but rather generated from interview transcript data and researcher generated memos, represented the power of art imagery within the Bimblebox exhibition ‘to reinvoke or reinforce existing, pro-environmental thought patterns, or to bring back notions of environmentally supportive behaviour to front of mind.’(green colour code 1 GMI, Table D5, Appendix D) A direct quote from a research participant exemplifies the operation of this mechanism as a potential aide-memoire and visual priming influence on behaviour:

> The other day, I was on the point of buying a new lampshade on impulse at a local supermarket. You know, I think I even had an image of the Bimblebox birds then, from the artwork we were talking about. Or if not those birds, an amalgam of different birds I have seen over time, but I had that idea. If I buy this thing what may be the cost or sacrifice to other things, like those birds? (RP interview, 07 2016)

The preceding sections have discussed the significance of several strands of findings within the present research which have helped validate components and mechanisms of environmental art influence on pro-environmental behaviour as described in the wider research literature. In the process, the existence of a possible variation of intensity of environmental art influence effects across different art genres and levels of artistic expertise then lead into discussion of research on the concepts of cognitive and visual framing of environmental messages within art practice. The concepts of salience and efficacy of art imagery as these factors may affect the influence of environmental art upon pro-environmental behaviour were used to consider differential research participant responses to artworks within the Bimblebox exhibition. I now go on to consider another possible application of these concepts; to throw light on the intriguing possibility of a twin track mechanism of environmental art influence as it may engage audiences with sustainability issues.

5.1.5 Identifying a possible twin track environmental art influence mechanism

The published findings on environmental visual framing and image salience and efficacy may help give credence to one final element of the research population response to the Bimblebox art. This relates to the topic of the breadth of impact, and therefore the reach, of environmental art influence for public sustainability engagement purposes. The population for this study was probably more pro-environmental in its motivation, intentions and behaviours at baseline than a representative Australian population (see Section 4.2.3). Although not undertaken in this research, it would have been intriguing to assess the research sample for the distribution of its intrinsic and extrinsic values set, the latter being more associated with pro-environmental behaviour in the literature (Kasser, 2011). The demographic and descriptive statistical data for the population set out in Figures 4.1 and Table 4.1 demonstrate that there was some considerable heterogeneity within the population, with some cohorts, for example, possessing much less experience of art exhibitions, and environmental art than others. There was also a range of PEB scores ranging from a Dark Green to Brown categorisation (see Table 4.1).

Notwithstanding these differences and despite my expectations to the contrary, there was no statistically significant correlation between PEB scores and intention to act in pro-environmental ways as stated within survey across the 12 months of the study. For example, a test conducted with the SPSS 24 package for a correlation of baseline survey PEB against baseline intention to act, gave the following result (Pearson correlation =-.142, n= 58, Sig (2-tailed) =.288 $p < .05$). Nonetheless, I was interested to further clarify this seemingly paradoxical data relationship in relation to possible art influence.

One possibility for explaining this outcome emerged from qualitative survey comments taken from cohorts of participants who had both high PEB (above a scale score of 50 in Figure 4.2) and low PEB scores (below a scale score of 50 in Figure 4.2). In the case

of the former group, some participants stated that they did not intend to act in PEB ways because, they said, they already had a high rate of activity in that regard; not because they were unmotivated or uninterested in pro-environmental behaviour, per se. Equally, some of the cohort of participants with lower initial baseline PEB scores stated an intention to undertake subsequent pro-environmental activity after experiencing the art because, in some cases, it had literally opened their eyes to environmental issues that had not occurred to them previously. The mechanism of this dual or twin track effect of environmental art influence, seemingly 'flattening out' the difference in response between high and lower PEB scoring participants, is well exemplified by the following participant quotes:

> The basic environmental issues tackled by the artworks were stuff with which I was already familiar. If I have scored some of the environmental behaviour questions as neutral, it is not because I did not think the exhibition was engaging or powerful enough – it is more the fact that I have been responding to those messages for most of my life now (Higher baseline PEB score participant, 11 2016).

> The image that these artists created, it really moves you. Actually, I could really feel what was happening there. In general, it was quite touching and quite impressive. I have never seen an exhibition about an environmental issue before. This is quite new to me. I think the biggest thing for me is the idea that in the nature refuge there are a lot of creatures there, speaking through the art. If there was no exhibition you would not know how these creatures have suffered. It raised my awareness, it raised my concern that the creatures and communities there are suffering. It makes you think about what is going on (Lower baseline PEB score participant, 03 2017).

This similarity of reported experience in cohorts possessing both higher and lower baseline levels of PEB, lent weight to a supposition that what was being observed in the sample was the existence of a twin track, uniform environmental art influence effect on varying levels of participant PEB. A similar idea was put forward by Curtis in 2007, primarily in relation to audience response to musical performance art (Curtis, 2007). His proposed

model for this mechanism is illustrated in Figure 5.2. below. The parallels between some elements of that model and the research findings from this study on exhibition art are noteworthy. Comments from both higher and lower scoring baseline pro-environmental research participants, taken from qualitative interviews at various sampling points, echoed the mechanisms portrayed on both sides of the diagram in Figure 5.2.

It is now possible to put forward a further hypothesis on the art influence processes that were operating within the present study. I achieved this by combining the findings on the substantial, pro-environmental influence exerted by the Bimblebox artworks on more than half of the research population with those on image salience and efficacy; and the possible twin track environmental art influences as described in the literature. Based upon these various research strands, it is probable that the Bimblebox research population, at baseline survey, had both higher and lower levels of pro-environmental motivation and behavioural profiles within its cohorts; but across the board, already possessed a number of environmental frames and interpretative storylines, of greater or lesser sophistication, about coal mining, species extinction and other sustainability related concerns.

This population encountered the diverse collection of Bimblebox artworks, and a majority found at least one piece of art from which they could take straight forward meaning regarding the intended sustainability messaging embodied. Participants were assisted in that process by the didactic panels which accompanied the works, but not without some weighing up of the communicative benefits of the art in relationship to the

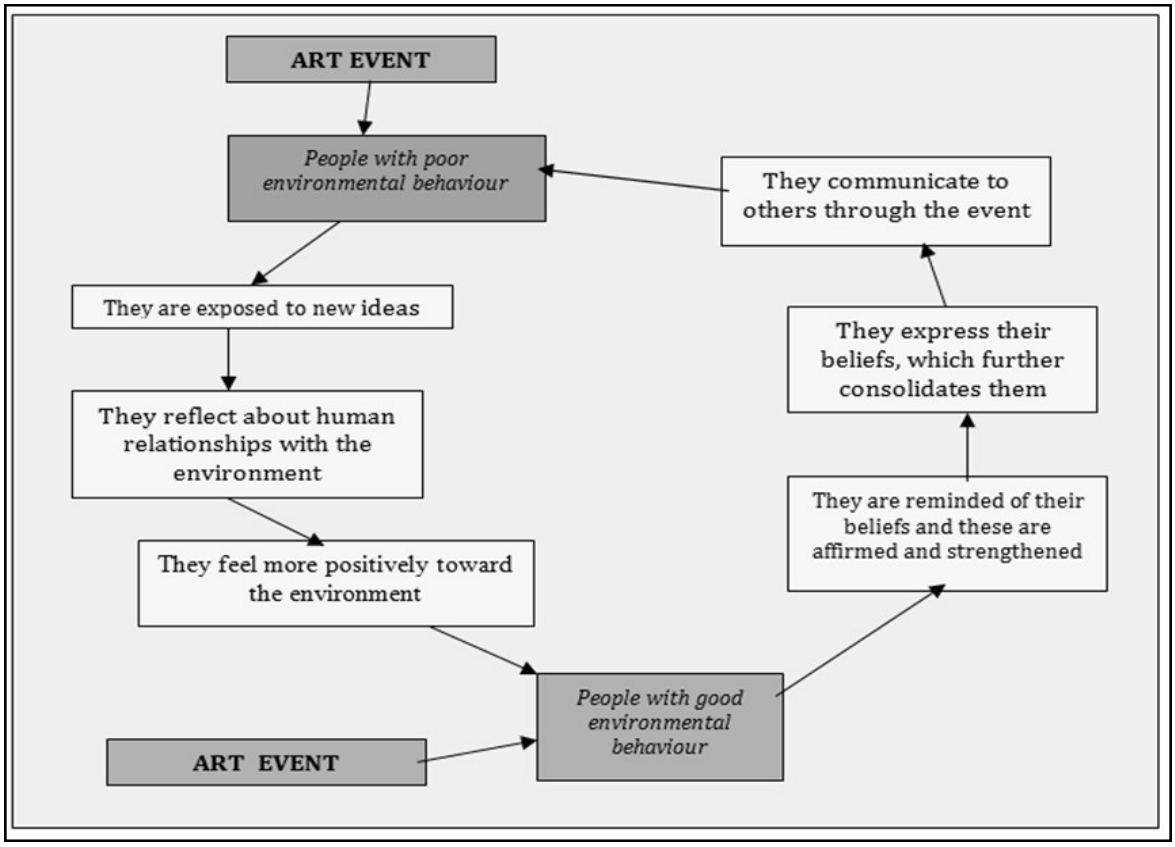


Figure 5.2: Model of how celebratory art events can affect environmental behaviour. from (Curtis, 2007)

texts per se. Some works were more immediately impacting or 'salient' than others for the audience because of the closer alignment between the environmental frames embodied in the work and those held by the audience members.

The efficacy of the artworks to promote pro-environmental motivation or behaviour change, at least at baseline, was associated with a number of factors both directly and indirectly connected to the works themselves. The ability of the art to reinvoke and elicit existing pro-environmental frames held by the audience; and to bring those back to front of mind, and hence strengthen them, was clearly important. So too was the social norm influence and encouragement given toward increased pro-environmental motivation in the audience. That is, by the inspiring advocacy and activist model provided by the artists who created the artworks.

In the end, I propose that the narrative of the Bimblebox exhibition creation, both in terms of the place story of the nature refuge it advocated for; and through contributing artist activism and passion for the cause of natural world conservation, provided an environmental storyline that was, probably, as much a part of the influential effect of the exhibition as the artworks themselves. Primed by the visual cues of the art, interacting with its embodied sustainability frames, and intrigued by the compelling story of the creation of the exhibition, a majority of the research population were engaged and influenced in pro-environmental ways by their multifaceted experience of artistic creativity. Furthermore, this occurred whether their original pro-environmental profile was 'Green' or 'Brown' at baseline. This scenario also offers a possible partial explanation for the seeming discrepancy noted in this study and others: between limited, generic audience experiences of environmental art overall, and the strong pro-environmental influence that same art can have subsequently.

5.2. The significance of digital technology presentation of environmental art for public sustainability engagement

The second research question interrogated the potential for art-oriented mobile software applications, and other digital art dissemination technologies, to enhance future public sustainability engagement with environmental art advocacy. The following discussion draws upon the findings from the Bimblebox exhibition case study and the relevant research literature referenced in Sections 1.3.2 and 1.3.3 to make a case for answering this question in the affirmative. It suggests that digital technologies are already changing traditional forms of commercial and social engagement across the board (Deloitte, 2016); and blurring previous traditional boundaries between public education, information presentation and behavioural engagement within the Galleries, Libraries, Archives and Museums, or so-called GLAM sector of particular relevance to the present study (Jones, 2015). Furthermore, such trends are forecast to strengthen over the next 10 years or so. (Johnson, Becker, Estrada, &

Freeman, 2015). By extension, there are challenges and opportunities ahead for environmental art advocacy to make better use of these technologies; and in order to present more sustainability issues to more audiences in more compelling ways.

5.2.1 The Bimblebox exhibition mobile software application

The Bimblebox exhibition incorporated an example of sophisticated digital technology presentation in the form of its companion software application, or app. This app was well received by a significant cohort of research participants in the study, who reported that it added value to and extended their artwork experience and reflection (Section 4.5). Research on the potential of app software to educate and engage an audience with environmental art practice, and the widespread public interest in apps and other, more recent, digital technologies more generally was described in the literature review of Section 1.3.2.

At any rate, the issue of quality of content, and the non-trivial use of app technology did not apply to the Bimblebox software. The main problem for the exhibition app was that it only reached a very small but enthusiastic audience outside of the case study research. If such a well-designed and well-received app were to fulfil its full potential in the presentation of environmental art as an educational and sustainability engagement resource, it would need to reach much greater numbers of people; more commensurate, for example, with the current, huge and growing scale of general public, online engagement with the museum sector in Australia and internationally (ABS 2012; Greene, 2014; ICOM, 2016; American Alliance of Museums, 2017). Perhaps the various components of the digital technology spectrum previously described hold out a promise to reach that wider audience; and to disseminate a far greater level of environmental art advocacy in the future.

5.2.2 Some implications for digital technology presentation of environmental art

Following on from the findings in the published literature it is interesting to consider the traditional presentation of the exhibition art genre in the present case study. The Bimblebox exhibition had an objective to develop an empathic connection to the natural world and other species in the audience viewing its artworks. An aspiration was to position the exhibition, at one level, as a 'place story' of the nature refuge it interpreted. This theme was indeed understood by and influenced some research participants, with 'empathy for the natural environment as influenced by the artworks' being the fifth most frequently identified, a priori language code appearing in qualitative survey data (see red colour code ENE in Table D5, Appendix D).

On the other hand, 'the value of using art to create a place story with multiple perspectives' ranked only eighth in frequency out of 32 possible, emergent language code factors obtained from research participant interviews (see green colour code 8 GMI in Table D5, Appendix D). It is interesting to surmise whether the empathic connection that was clearly engendered by the Bimblebox art could have been further strengthened if AVR presentations of the exhibition had been available; and notwithstanding that financial considerations would have been a major constraint on that possibility occurring in practice.

Communication of information, developing empathy for the natural environment, and embedding art into ecologically sustainable development initiatives, including public art installation, are the three pathways of postulated environmental art influence on sustainable development promotion put forward in the Curtis, et al. (2014) model, used for comparative purposes in this present research.

Furthermore, the published literature findings on digital technology applications, as described in this section, strongly suggest that they may be able to enhance the presentation

of environmental art advocacy across all three of these pathways in the future. It also follows that there would be great value in a more systematic adoption of the new digital technology opportunities to present environmental art by the museum and gallery sector. This is especially the case given the unrivalled physical and online infrastructure possessed by that sector (De Gruyter, 2012) and, equally, the high level of public trust it enjoys in the so-called post-truth era (Art New England, 2017).I expand on these points later in the chapter.

5.3 The significance of the museum sector in presentation of environmental art for public sustainability engagement

The Bimblebox: art-science-nature exhibition was presented, physically, through a wide and diverse range of museum and gallery institutions across Australia. Each of those venues caters to their own unique communities of interest, with their own particular demographic and cultural characteristics. In combination, however, these venues provided a public educational and sustainability engagement space which, in the case of the Bimblebox exhibition, allowed more than 45,500 members of the public to engage with the sustainability-oriented, environmental and socio-cultural messages embodied within its artworks.

The thematic report produced from the key informant interviews I carried out with a cohort of artist and museum curators in this research (see page 198, Appendix D) demonstrated that, notwithstanding some caveats on funding sources and the overzealous adoption of technology, there was an in-principle interest in providing more opportunities for environmental art presentation in association with Australian museum venues, both physically and online. I propose that the task of increasing audience engagement with environmental art presentation in the museum sector, based upon the implications of research discussed in this thesis, could be advanced within the sector:

- By systematic curator incorporation of research findings on environmental art

imagery salience and efficacy into considerations on the auspice, support or commissioning of environmental art presentation;

- By assisting with effective levels of design, promotion and distribution of environmental art software apps, and other forms of digital technology presentation of environmental art ;

- By provision of ancillary reference and resource materials, using free, online educational resources, such as relevant Massive Open Online Courses;

- By adopting digital technologies which can help museums and galleries with more effective, two-way monitoring of the experience of their audiences as they interact with environmental art presentations;

- By supporting and promoting enhanced museum sector understanding of the educational and engagement needs of its audiences as they relate to public, triple bottom line sustainability adoption.

In Section 4.3.2 a description of analogue visitor book data for the Bimblebox exhibition demonstrated the sort of insights which even that traditional and simple form of visitor feedback can give. In contrast, contemporary digital software, which can be installed on a museum visitor's own smart devices, is already providing vanguard institutions, such as the Brooklyn Museum in the USA, and the Museum of Old and New Art in Australia, with a range of more sophisticated, two-way, data collection and provision opportunities. For example, the technology can provide an interface for art exhibition visitors to receive real time answers to questions posed by them to museum curatorial staff (Brooklyn Museum, 2014) or allow visitor's self-curation of favourite artworks for later viewing online (Museum of Old and New Art, 2017).

Such interactive data flow, enabled by digital technology, not only allows exhibition venues to better collect and interpret visitor interaction and experience of an artwork; it also allows visitors themselves to make suggestions on how collections and art might be better presented, in real time. Whilst at present the preserve of larger and better funded venues for

art presentation, the costs of such technology are steadily coming down, and may be much more affordable in the near future (Johnson et al., 2015).The future application of such technology is imagined in the conclusion of the thesis at Section 6.5.

These various technology applications could assist in achieving the objective of presenting more environment art advocacy to more audiences in more museums; both online and through digital technology enhanced physical venues. As previously described, when asked about their perspectives on the value of increased public environmental art exposure in Australia through the museum and gallery sector, there was unanimous, in principle support from the small group of Bimblebox exhibition contributing artists and museum curators who responded to survey (n=10). This same pro-sustainability engagement ethos could be applied to the international museum sector which possesses a very extensive built infrastructure and online presence; with concomitant public visitation, both physically and online. For example, in 2012 one directory listed more than 55,000 separate museum institutions across 202 countries (De Gruyter, S. 2012).

The visitor volume in the sector within the last few years has reached very large levels. For example, in Australia, in 2008 alone, there were an estimated 51.5 million ‘unique online visits’ to museums; a figure that was almost treble the physical venue visitation rate that year; and both trends were noted to be increasing at that time (Australian Bureau of Statistics, 2012). In light of the earlier discussion on potential digital technology dissemination of environmental art, it is interesting to note that the volume of online museum ‘visits’ in the form of internet, social media, software app or other forms of digital interaction within the sector now equals or even exceeds the physical visitation figure by a wide margin. Elsewhere, in the USA, 850 million physical visits per annum have been reported there recently (American Alliance of Museums, 2017). Equally, there are large, proportionate annual visitor statistics for countries such as the UK, accounting for tens of millions of

physical visits per annum. Although no robust, published data on global visitor engagement with the museum sector was available at time of writing in 2017, a conservative estimate, based upon the figures cited here for a microcosm of the sector, suggests that it would be receiving billions of cumulative physical and online interactions with global communities annually.

If the probable art advocacy influence rate suggested in the present study could be applied to even an increased fraction of this global museum audience, the impetus generated for greater public sustainability adoption could be huge. At any rate, the existing scale and nature of visitor engagement with the museum sector generally makes it a valuable public space in which to convey effective sustainability messaging to international communities.

Across decades now, the sector itself has been debating a 'new museology' perspective on its current and future relevancy across a range of cultural concerns (Assunção dos Santos & Primo, 2010). These debates have included triple bottom line sustainability adoption. One example of such adoption is provided by the better environmental management of the sector's building stock (Museums & Galleries Queensland, 2017) or, in some quarters, increasing interest in social justice concerns and the museum sector's social impact in helping address these. The new museology is linking the traditional and trusted educational role of museums to their capacity to make a practical difference in the lives of the communities of interest they serve. In the UK for instance this approach now includes museum public engagement in areas of mental health and wellbeing, offending behaviour and unemployment (Museums Association, 2017).In Australia, the peak professional body of the museum sector provided a policy statement in the early 2000's linking the new museology ethos to triple bottom line sustainability adoption when it suggested the sector had an important role in:

> Building the public's awareness and practical knowledge of sustainability by encouraging civic

> discussion, research and disseminating success stories in exhibitions; assisting in the education of the community for sustainability by creating an understanding of how natural, economic and social systems work and are interdependent; assisting in the building of community capacity through forums, conferences and other events that provide an opportunity for public discussion on sustainability; and recognising the value of, and integrating where possible, traditional knowledge and intergenerational considerations (Museums Australia, 2003)

A few years later, in relation to climate change issues, a major academic research project in Australia suggested that:

> The big task of the museum sector is not only to inform publics on the science of climate change but also to equip citizens with tactical knowledge that enable participation in actions and debates on climate change that affect their futures (Cameron, Hodge & Salazar, 2013)

Most recently, these earlier visions for public engagement, through education for sustainability, have come to fruition in the latest generation of international science museums. Here, in some cases, the sector is now engaging public audiences directly and systematically with anthropogenic climate change concerns (Jockey Club Museum of Climate Change, 2017) or the particular significance and challenge of sustainability adoption within the Anthropocene era (Museum of Tomorrow, 2017). These museums are working to present their traditional research function and scientific insights at a more inviting, intelligible, everyday human scale. They are also aspiring to engage their audiences with international sustainability capacity building initiatives, such as the 2030 Global Agenda for Sustainable Development to achieve the Sustainable Development Goals. They see such an objective as a valid part of their mission and ongoing work (UNESCO, 2016; ISCSMD 2017).

5.4 Looking ahead: enhancing public sustainability engagement through an intersection of environmental art and museum practice as enabled by digital technology

The sustainability intersection already described could be further strengthened by developing systematic linkages between it and three other, fairly recent initiatives emerging over the last 10 years or so. These are the renewed focus on education for sustainable development and global citizenship, the strengthening turn toward collaborative environmental art-science practice, and the capacity of environmental art to render the 'invisible visible' in the era of the Anthropocene. I now discuss each of these possible, collaborative practice areas in turn.

5.4.1 The complimentary role of education for sustainable development

Education for sustainable development (ESD) is a pedagogic model aimed at achieving global social transformation and more ecologically sustainable societies by 'empowering learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity' (UNESCO, 2014, p.12). In fact, this mission statement could be considered to have had considerable alignment with the both the advocacy objectives and pro-environmental education, motivation and behavioural outcomes produced by the Bimblebox exhibition itself. Additionally, ESD provides the educational backbone of current, international sustainability adoption strategies such as Agenda 2030 and the Sustainable Development Goals as described in Chapter 1. Some of the requirements for ESD include the stimulus of critical thinking skills centred on values education in learners and their collective, hands-on engagement with real world sustainability concerns within a pro-learning culture.

The sustainability concerns embraced in ESD can range from the local to global scale depending on the community of interest involved. Furthermore, there is a clear overlap between several of the characteristics of the ESD model and forms of art practice that have been used by educators for environment oriented presentations to the community. An example here is the use of dramatic performance art to engage young people in environmental education (Curtis, 2010; Curtis et al., 2013). By definition, ESD educators are those who:

> Often draw upon the arts, using drama, play, music, design, and drawing to stimulate creativity and imagine alternative futures. They work towards positive change and help students to develop a sense of social justice and self-efficacy as community members (UNESCO, 2012)

By substituting ‘adults’ for the word ‘students’ in the quote above it could almost be rendered as a definition of some existing community arts engagement practice. Certainly, some of the elements of ESD above resonate with the principles of community arts and cultural development practice (CACD) which ‘involves artists working collaboratively with communities for the purpose of social change through art and culture’ (Creating Australia. 2018). Such practice may demonstrate ‘a commitment to the empowerment of individuals and communities through participatory and inclusive practices that recognize and promote the strengths and resources already existing within communities (Sonn, Quayle & Kasat, 2015 p.99).

Such CACD oriented work now encompasses a diverse range of projects. I shall take just a few examples from one CACD practice theme: that of work with marginalised, disadvantaged or vulnerable youth. Such work could be considered to contribute to the social bottom line of triple bottom line community sustainability engagement as already considered. The use of photography and photo elicitation has been used to develop a stronger sense of place and attachment for marginalised youth in rural Australia (Sonn, Quayle & Kasat, 2015). The recording and sharing of oral histories has been used to tackle community crime impacts

and isolation in disadvantaged areas of regional Australia (Wright et al., 2016).In the UK, creative arts workshops have been used in hospitals, hospices and respite centres to ‘take the focus away from young patients’ illnesses, injuries and disabilities’ and hence reduce their anxiety and stress. (Create Arts Org, 2018).

It seems that CACD oriented arts practice is also stimulating reflection on more holistic ways to evaluate the public engagement outcomes of art, and some of these more encompassing assessments may be of use in future research on the influential public influence of environmental art specifically. For example, Dunphy, drawing on earlier work by Hawkes and Ife, has proposed up to six possible criteria by which public engagement impact of the arts could be assessed (Dunphy, 2015; Hawkes, 2010; Ife, 2002). These criteria would evaluate the impacts of art practice variously in terms of: social equity, economic viability, environmental responsibility; cultural vitality; civic engagement and personal-spiritual wellbeing (Dunphy, 2015 p.252).

The ‘art for politics’ themes occurring in some forms of participatory art practice are also relevant here (Lowe, 2012). As with CACD oriented practice, some of these themes have resonance with the principles of education for sustainable development due to their emphasis on the ability of art creativity to ‘contribute new tools or opportunities for cultivating political literacy and nurturing engaged citizenship (Flinders & Cunningham, 2014, p.5). Whilst much of the writing on ESD principles and development has centred on the formal schools’ system, its value as a model for informal or formal adult sustainability engagement, through popular or tertiary level education, is also widely acknowledged (DESD, M., 2014 ; Karatzoglou, 2013).

Current practices within ESD are not without their critics, and a number of improvements to the basic model have been suggested in recent years (Huckle & Wals, 2015).Notwithstanding these limitations, the ubiquity and wide acceptance of ESD as a

method to achieve wide-scale public sustainability engagement could provide a supportive framework within which the environmental arts, museum and digital technology intersection could operate. Furthermore, some of the similarities and alignments between the principles of ESD, and examples of participatory art practice, as evidenced from the community arts and cultural development field, point to their potential goodness of fit within the public sustainability engagement intersection considered earlier in this chapter.

5.4.2 The turn toward art-science collaborative practice

The Bimblebox: art-science-nature exhibition provided an example of a type of environmental art and science collaborative project which has emerged increasingly in Australia over the last 10 years or so. In reference to the environmental art typology set out in Table A1 of Appendix A, some of the Bimblebox artworks typified a genre of art-science collaboration which is inspired by the process of scientific research. This genre employs aspects of the scientific method to explore and present the features and functioning of the natural world, from a macro to micro scale. In the process, similarities between art and science focussed on the human-environment relationship may become apparent because:

> Both science and art advance through moments of creativity. They involve research and experimentation, the possession of specialist skills that are refined over years, and a passion to communicate. Art and science change perceptions, produce emotional responses, and force us to question ourselves and our place in nature. (Ku-ring-gai pH: art and science project, 2016, p7)

Collaborative art-science projects provide an opportunity to forge joint, investigative connections between artistic and scientific perspectives on environmental problems, including input from the public. In the process, they can bring the possibility of more holistic approaches to the analysis and solution of such problems. In the case of the Bimblebox exhibition, the proximate artistic concern was with biodiversity loss in a terrestrial nature refuge threatened by coal mining. Some other recent Australian environmental art-science

collaborations have explored topics as diverse as: climate change impacts on Antarctic krill and ecosystems productivity (Australian Government, 2015); negative change in marine and coastal environments viewed from both an environmental and indigenous perspective (Museum and Galleries Queensland & Gold Coast City Gallery, 2014); the remediation of heavy metal pollution in estuarine environments (Glenorchy Sculpture Park 2017); and acoustic and visitor impacts on environmental values in a peri-urban national park setting (Eramboo Artist Environment, 2017).

The benefits of increased collaboration between environmental art and science in terms of the disciplinary enrichment of these two epistemologies is, arguably, a belated contribution to C.P. Snow's call in 1963 for a 'third culture' amalgamation of the arts and sciences (Snow, 1959) with its suggestion that: 'practitioners in both areas should build bridges, to further the progress of human knowledge and to benefit society' (Scientific American, 2009). Viewed from this perspective, current environmental art-science collaborative practice takes its place alongside other important 'bridging' elements, which have appeared in recent decades. One example of such an element is the popularisation of difficult and complex scientific issues in the writings of public intellectuals (Brockman & Gratzer, 1995). Another lies in the emergence of the environmental humanities field (Nye et al., 2013).Other 'bridges' are being provided by some government funded initiatives to better integrate arts and science research, such as the Science in Culture project of the UK's, Arts and Humanities Research Council (AHRC) which:

> …aims to encourage mutual exchanges between the sciences and the arts and humanities that offer scope for developing new areas of research, methodologies, research frameworks and styles of thinking as well as pioneering new ways of working across the disciplines (AHRC, 2017).

5.4.3 Environmental art making the invisible visible in the era of the Anthropocence

The various ways of building Snow's metaphorical bridge between science and popular culture, share one particular attribute. They are capable of 'making the invisible visible.' That is they possess an ability to render intelligible to an audience a previously obscure idea, belief system, or relationship or 'to synthesise complex ideas and present them to lay audiences in an engaging form' (Reid, Reeve & Curtis, 2005, p1). Within this current study, participant responses to exhibited environmental art have revealed the importance of the social and emotional, as well as purely cognitive drivers influencing an audience in its ability to attain this metaphorical visibility. In this case, a clarification of the extent of serious, exploitative problems in the human – environment relationship associated with extractive industries (see Sections 4.4.2 and 4.4.5).

The mechanisms of visual framing and priming discussed in Section 5.1.3, and demonstrated through qualitative interview language coding (see Table D5, Appendix D), seem to have caused a few Bimblebox research participants to reflect upon more deeply held ideological and economic worldviews, narratives and belief systems, which help underpin the environmental problems the exhibition portrayed. Unfortunately for many, these deeper, often sub-conscious psychological frames remain 'invisible' and go largely unremarked and unconsidered at the level of much, contemporary discourse on public sustainability engagement (Huckle & Wals, 2015).

The findings from this present research have further validated the educational emotional and reflective capacity of environmental art to engage audiences with sustainability issues, and the framing of them, in part by making them less 'invisible.' Another way of putting this is to say that environmental art advocacy can make a contribution to developing critical thinking skills and reflection about environmental impacts amongst

audiences; and in this manner, it can provide one way to 'inoculate' the public against misinformation spread about the seriousness of environmental decline (van der Linden, et al. 2017). Such views are consistent with findings appearing in the published literature which have proposed the greater interdisciplinary sophistication needed to design and present effective environmental science communication (Nisbet & Scheufele, 2009; Lakoff, 2010; Corner, Webster & Teriete, 2015; van der Linden, et al. 2017). These new communication methods have to address the neurobiological, cognitive, linguistic, and social psychological factors that are now known to contribute to the 'invisibility' of certain environmental and sustainability topics for the general public.

Moreover, these more interdisciplinary and sophisticated methods will also need to engage individuals in ways that bring them to understand the personal relevance and value, to themselves and their families, of their contribution to remedying environmental decline in ways commensurate with its seriousness, scale and pace in the era of the Anthropocene (Howes, et al. 2017). It has been suggested that such methods will form part of the needed corrective response to the 'failure' of more traditional environmental and sustainability communication approaches to public engagement and will be able, finally, to get across to communities the reality that, presently:

> Many of the policies and practices of sustainability are really about being less un-sustainable. As such they fail the test of proportionality — valuable but inadequate in the context of the challenges of cultural renewal and systemic redesign we face (Wright & Nyberg, 2014, cited by University of Technology Sydney, 2017).

This present research has suggested it is highly probable that environmental art can bring cognitive, social and emotional factors to bear in pulling back the public 'invisibility cloak' on crucial sustainability issues such as anthropogenic climate change, biodiversity loss and ocean acidification. When combined with the trusted educative expertise of the museum sector; and the seeming potential of emerging digital technologies such as AVR to

make the ‘invisible visible’ in relation to scientific and abstract concepts (Olympiou & Zacharias 2013; Yoon, & Wang, 2014), optimism grows that environmental art advocacy, as part of the sustainability intersection, may, indeed, be able to help close the environmental–attitudes action gap at scale. However, as with other forms of public environmental science and sustainability communication and engagement, there remain major challenges for art practice to face in this task.

As described in Section 1.2.2, some sustainability related ‘hyperobject’ concepts (Morton, 2013) which are particularly pervasive, complex, and threatening, such as anthropogenic climate change, may be largely beyond the powers of traditional science communication to engage the public at all. Accordingly, if it is to stay relevant, science communication may now have to wrestle with the seeming cognitive incapacity of many individuals to grasp the nature and scale of human-induced environmental decline; and the extent of ecological damage inflicted on natural systems. It may also need to consider other factors relevant to public sustainability engagement.

Such factors include the personal psychological defence mechanisms such as anxiety and risk aversion generated in the face of overwhelming environmental news (Stoknes, 2015).Unfortunately, negative emotional states are claimed to counter the more expansive, creative and strategic thinking associated with positive emotional response and states. (Fredrickson, 2004).Both emotional states were present in the Bimblebox research sample, but the bias was predominantly toward the former. Another factor of relevance here is the inability of contemporary social, economic and political institutions to adequately represent, either ethically or legally, the needs of other species and the ecological integrity of the biosphere (Latour, 2016).

What seems to be implied in such anticipations is that we have entered an era of accelerating environmental decline; an era which is co-incident with an extensive individual

psychological and cultural retreat from the severity of sustainability problems. Art practice may be set to play an increasingly important role in addressing the public and institutional incomprehension of the scale and nature of the social and economic reforms required to address these sustainability problems adequately. For instance, a public, democratic mandate for implementing effective solutions is going to require nothing less than:

> Reshaping the way we think about ourselves, about our societies and humanity's place on earth...traditions of Western thought have reached their limits...it is the question of 'how to think' in a climate-impacted era that needs primary attention (based on quotes by Hulme and Palsson cited in Boulton, 2016, p.775)

Notwithstanding the severity of this formulation of the environmental attitudes-action gap, researchers such as Boulton (2016) recognise a continuing and effective engagement role for a broad range of the arts in meeting the public sustainability engagement challenge involved. In a thought provoking and integrative recent paper, Boulton describes ten insights derived from environmental framing research that might contribute to better levels of public sustainability engagement with 'invisible' conceptual hyperobjects, such as climate change. Several of these categories appear to have direct alignment with the sustainability engagement capacities of environmental art advocacy and include: the empowerment and contribution to learning that can be achieved by the constructive elicitation of emotion; and the value of imaginative narratives and imagery, metaphors and storytelling to convey, clearly and unambiguously, ideas and concepts outside of the common-sense experience of many people. She also mentions the need to find ways to engage people with new concepts in unifying ways that foster dialogue, as opposed to polarising debate or dispute.

Boulton seems to be another exponent of Snow's third culture prescription, given her suggestion that we need '60,000 of the world's best story tellers, orators, philosophers, filmmakers, and other arts, and humanities experts.' In her view, this group of cultural

creatives should partner a similar number of natural and social scientists estimated to be working on research issues connected to implementing transformations towards sustainability (Boulton, 2016 p.780).

The philosopher Bruno Latour also believes in an important future role for arts practice of various kinds to engage the public with sustainability concerns. He sees the value of art in this role as providing an ‘aesthetics defined as what makes us sensitive to hitherto unknown phenomena.’ From this perspective art can contribute to a new ‘poetics’ that will ultimately help transition inadequate public and political responses to the sustainability crisis by catalysing new forms of public ecoliteracy and environmental stewardship within what Latour terms a cosmopolitics of public engagement (Latour, 2016) The fact that a continued, important and influential role for art practice is being foreseen in some of the newest and freshest interdisciplinary research approaches to

understanding the global sustainability crisis, and how it might be better addressed, is, to my mind, a further strong validation of environmental art advocacy. Such research also adds weight to the belief that environmental art and art-science collaborative practice could be a valuable raw resource within a reinvigorated process of education for sustainable development and global citizenship which borrows liberally from environmental philosophy and the environmental humanities. It is intriguing to consider the possibility that as the twenty first century progresses, environmental art practice may break new ground in the process of rendering invisible environmental hyperobjects ‘visible’ to the public; and help foster a new public aesthetics and cosmopolitical understanding of the human-environment relationship. Such an understanding would help value and promote our much needed, responsible and respectful role within nature.

5.5 Limitations of the research

This case study was based on a relatively small purposive research sample (n=79) with a probable skew toward higher levels of baseline pro-environmental behaviour than a larger representative sample would have possessed. In practice, this skew was not problematic in practice as there was sufficient homogeneity and heterogeneity across cohorts to interpret some interesting findings from the data. For instance, the homogeneity of the research sample allowed for a demonstration of the broad similarity of artwork influence effects across the Bimblebox exhibition audience as a whole. The heterogeneity of the sample allowed a hypothesis to be developed around the postulated twin-track environmental art influence mechanism already described.

Original concern for the effects of attrition rates in such a small sample was also not borne out, and participant recruitment and retention rates were maintained across the 12-month longitudinal survey period. One practical limitation on this research was the lack of a control group in sampling and surveys. This would have allowed for robust quantitative inferences to be made about a direct, causal relationship between artwork influence and pro-environmental behaviour. A larger, commercially recruited research population, surveyed over longer periods and with control group design, could have been one possibility here, although this would have posed some methodological and significant resourcing issues.

The design of the current research was strongly influenced by a few published studies, already cited in this thesis, which explored environmental art influence on pro-environmental behaviour. That published work was based around case study reviews of previous environmental art projects or recruited relatively small research populations of up to a few hundred participants at a time. Those studies also used mixed methods in their survey work, including analysis of Likert scale data. And they also lacked control group design (Marks, 2016; Curtis, et al.2014). The ability to incorporate a control group could serve a valuable

role in future research on audience environmental art influence. The visitor data analytics work of the museum sector as described in Section 6.2.1 might provide a particular opportunity for such work.

Notwithstanding these various issues, the mixed method, iterative quantitative and qualitative surveying used in this study produced a workable data set. The current research findings were strong enough to evaluate the key questions posed, and achieve the objective of making a contribution to the existing but limited research field on art influence onto pro-environmental behaviour. The findings and limitations of this present research and an overview of the extent of various related research fields obtained through literature review have encouraged me to make some recommendations for possible future research contributions.

5.6 Summary

The various points of discussion in this chapter have helped reinforce one key inference that has already been described several times in the thesis, and which will be further mentioned in Chapter 6. That is, that the individual elements of environmental art advocacy, the museum and gallery sector, and the current and emerging digital technology spectrum, are already beginning to form a logical and valuable synergy, or sustainability intersection, which, if further promoted, could make a greatly enhanced contribution to public sustainability engagement in the future.

CHAPTER 6: Conclusion

6.1 Major thesis claims and review of findings

As described in Chapter 1 the sustainability challenges we now face in terms of accelerating environmental decline in the era of the Anthropocene is unprecedented in human history. I started this work because I wanted to help to close the contemporary, environmental and sustainability attitudes-action gap which has cost global society so dearly in slowing the rate of urgently needed, triple bottom line sustainability adoption. This gap has impeded systemic reform, and obscured the reality that many contemporary sustainability adoption policies and strategies are not fit for purpose; they will only result in us becoming somewhat less un-sustainable over time. These impasses require the deployment of every means at our disposal to engage and build capacity for authentic ecological sustainability in global society; and to address the magnitude and urgency of needed environmental remediation and adaptation, social transformation and economic reform. Within the suite of actions required, the role of arts practice in helping to educate, inspire and empower global communities toward more supportive behaviour toward the environment is recognised in contemporary, strategic international plans; and has had a long history of informal recognition within environmental education and conservation movements.

My own focus on environmental art advocacy as a way to help close the attitudes-action gap connects to my longstanding awareness of the influential power of art within the television nature documentary genre described in the preamble to this thesis. It also links to a lifelong experience of watching conventional methods of popular science communication on environmental impacts gain insufficient traction with the public. Now, at the end of this project, I have been able to answer the three main research questions I posed in regard to public sustainability engagement: on the influential public engagement mechanisms of environmental art advocacy; on the value of digital technology presentation of art; and on

the enabling influence of museum sector community outreach; The answers obtained have helped me address the research problem of the attitudes-action gap and I have made some recommendations for subsequent research in the light of these answers in Section 6.2

My most important result is that I have been able to verify the existence of a number of theoretical mechanisms of influence that have been advanced to explain how environmental art advocacy can effect change in the pro-environmental motivation and behaviour of audiences (Klöckner, 2013; Curtis et al., 2014). Some of the specific behavioural effects noted as a result of experience of the Bimblebox art included participant budget research on domestic energy saving technology, conscious change of certain work practices, and decisions to attend environmental public protests (see Section 4.4.7 and Appendix E). The fact that these mechanisms were observed to be operating within my research sample further validates the importance of the environmental art medium as a valuable resource in future, public sustainability engagement initiatives. By extension, this also confirms the contributory role that art can play in helping to close the environmental attitudes action gap.

Furthermore, by relating the findings from the Bimblebox exhibition case study to those taken from literature review it has become clear to me that an emerging art-sustainability intersection, in the nexus between environmental art practice, museum sector outreach and digital technology presentation could offer major, new opportunities for environmental art advocacy to engage the public with pressing sustainability issues in the era of the Anthropocene. I propose that this intersection is already well-aligned to strategic, international sustainability education and capacity building initiatives.

Now I briefly review the findings from research participant response to the Bimblebox exhibition, which lead to these conclusions. My comments are linked to the original environmental and behavioural psychology models I used for comparative purposes in this work, which are reproduced in Figure 1.1. I also draw on the discussion of present

findings, which I gave in Chapter 5. My key findings revealed the positive overall response of the Bimblebox exhibition research population to its artworks; and confirmed the operation of several theoretical factors operating to influence the perception of pro-environmental motivation, intention to act or actual pro-environmental behaviour in more than half of the research sample of the case study. Survey results demonstrated that, for this particular form of art exhibition, the communication of environmental information, an associated awareness of environmental consequences; and an admiration for the environmental and social norms held by the exhibition artists were the three main factors of influence at play. All three of these factors are described in Figure 1.1.

Other notable findings pointed to research participant concern with finding a balance between experience of the Bimblebox art itself, and understanding its meaning through didactic explanation; the power of art imagery to reinforce existing pro-environmental thought patterns, and bring back pro-environmental motivation to front of mind; and the power of the art to communicate through emotion; either negatively, for example through shock or fear; or positively, through the humour or aesthetic joy elicited by the exhibition artworks. These latter findings, in combination with those from literature review on the perceptual salience and behavioural efficacy of artistic imagery, offered a possible explanation of differential audience response to diverse artworks; and supported the notion of a theoretical ‘twin track’ process of environmental art influence operating on research participants, irrespective of whether their baseline pro-environmental behaviour profile was high or low.

The corroboration of theoretical art influence mechanisms in this research was supplemented by affirmative findings on digital technology and museum sector presentation of art. The positive reception to the Bimblebox software app, at odds with its limited national uptake, helped contextualise literature review findings on the emerging use of various digital technology applications in public educational engagement related to environmental art.

Additionally, published international findings on new forms of community outreach and engagement in the museum sector helped contextualise the survey response of a cohort of Australian art and museum practitioners within this research. The latter were unanimous in their in-principle support of a future role for environmental art advocacy as a public engagement tool. Taken in the round, these various findings catalysed my theorising on the future public sustainability engagement opportunities offered by a systematic art sustainability intersection.

6.2 Suggestions for future research – environmental art practice

The environmental art-science collaborative turn within the last 10 years or so, whilst greatly to be applauded and supported, appears to have experienced a dearth of formal research investigation, as has more generic forms of environmental art practice. On the one hand, there is anecdotal art and science practitioner commentary on the mutual, respective benefits of collaboration between these two, interrelated fields of creative inquiry into the human-environment relationship; on the other hand, there appears to be very little academic exploration of what contemporary environmental art-science collaboration can bring to better communication with the public on the enormity and pervasiveness of the environmental challenges of the Anthropocene.

Equally, emerging research work on the visual framing of pro-environmental and sustainability narratives would benefit from addition, as would the differential effects of salience and efficacy in artistic imagery influence on pro-environmental behaviour. Another area of environmental art influence to explore here is the possibility of a continuum of intensity of public engagement with art occurring across a spectrum of environmental art genres. These genres range from exhibited and public installation works to musical and theatrical performance art. Such a research exploration could become part of a ‘what works best’ inquiry into the effectiveness of environmental art engagement of the public that was introduced in Section 5.1.2.

6.2.1 Research associated with museum sector practice

The museum sector has had a long tradition of collecting visitor attendance data, and using data analytics to better understand its audiences. There is some anecdotal evidence that the momentum of such audience evaluative work has fallen away in some quarters over recent years, partly in response to significantly reduced levels of funding support to the sector. There is probably now a significant need to reinvigorate museum visitor data analytic interpretation; certainly, in terms of visitor interaction with environment-oriented collections, including environmental art exhibitions.

Such a strengthening of analytic feedback would give the sector a better opportunity to evaluate any social and environmental community capacity building outcomes it achieved. The adoption of increasingly ubiquitous and cheaper digital, data analytic applications may make this more of a reality for the sector across the board. An enhanced interactive exchange of data using such technology is already occurring between museums and their visitors in the vanguard of the sector as described earlier.

Data gathered within museum settings, on the extent of environmental art influence on subsequent audience pro-environmental behaviour, could be considered important informal research, and could make a useful contribution to the monitoring of best practice within an evolving art, museum and technology sustainability intersection. A precedent for the more assertive, educative and facilitative sustainability adoption role for museums, in terms of social justice outcomes, exists within the ‘museums change lives’ initiative described earlier. The on-line provision of professional museum case study findings from such initiatives is a good model for the dissemination of this sort of informal evaluation.

6.2.2 Research associated with digital technology applications

Some recently published findings first described in Section 1.3.2 and 1.3.3 and discussed in Section 5.2.2 and 5.3 related to the capacity of digital art presentation to engender empathic response in viewers; and the alignment of those findings with the importance of empathic

connection with the natural world in public engagement with environmental issues (see Figure 1.1). Given these antecedents, it would be valuable for more work to be conducted in the area of digital empathic emotion generation, and the communication of complex ideas to users of virtual reality and augmented virtual reality; particularly as this might relate to the presentation of environmental art themes within public sustainability engagement initiatives. Some future opportunities for the use of digital technology were introduced in Section 5.3, as was a brief description of the use of Massive Open Online Courses (MOOCs) to impart environmental and sustainability knowledge to the public in conjunction with environmental art. The ability of sustainability-oriented MOOCs to add value to the public engagement capacity of environmental art advocacy would be another fruitful area of research.

Equally, both these potential areas of digital technology presentation of environmental art could be evaluated informally, through environmental arts and museum practitioners, ideally working in collaborative partnership. Two other areas with currently limited research literatures which would benefit from either academic or professional evaluative research are: the embodiment of environmental art practice within eco-visualisation projects which engage the public with real time environmental and ecological data (Section 1.3.2); and the use of augmented virtual reality applications to enhance the public engagement potential of environmental messaging within public installation art (Section 1.3.2).

6.2.3 Research associated with the art-sustainability intersection

With reference to Figure 6.1 the key areas for both formal and informal research in this area would be around a ‘what works best’ exploration of the potential of the art-sustainability intersection to synergise with international capacity building frameworks. The 2030 Agenda for Sustainable Development, the Sustainable Development Goals, Global Citizenship Education, and Education for Sustainable Development are all strategies, which seek to drive a powerful education agenda for sustainability adoption worldwide. Future

research in this field might be oriented toward finding greater points of leverage to energise these strategies; for instance, by incorporating more and diverse examples of environmental art advocacy as a key pedagogical resource within them.

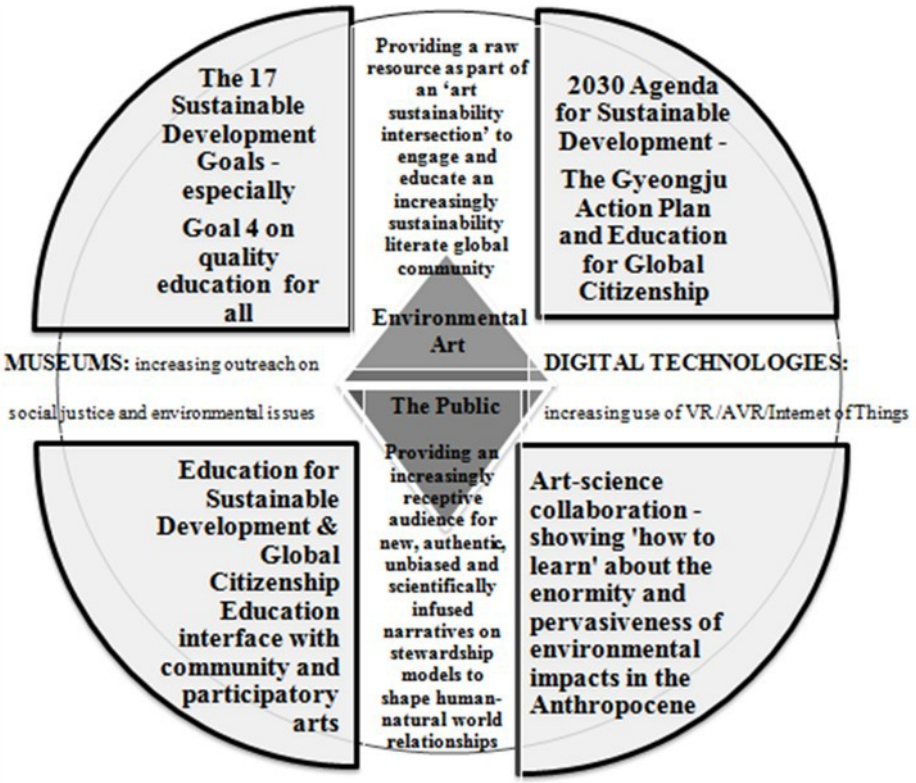


Figure 6.1: The art-sustainability intersection and its alignments with other public sustainability engagement initiatives

Case studies of projects incorporating cross-fertilisation and synergy between environmental art practice and such strategic international educational frameworks could make a useful contribution. There may well be some natural points of alignment between the sustainability education principles of the strategies described (Section 5.4.1) and those of contemporary community and participatory arts practice. It would be useful to conduct case study research on the operation of such alliances as they may be fostered.

6.3 The legacy of the Bimblebox exhibition

The lasting outcomes of the Bimblebox: art-science-nature exhibition can be considered in three related ways. Firstly, the exhibition stands as an impressive example of community

environmental art advocacy; one which had a highly probable and significant influence on the pro-environmental motivation and behaviour of its audiences. The educative, emotive, inspiring and behavioural influence of the Bimblebox artworks was found to extend to over half of the research population, and these effects were maintained across a 12-month period. A likely wider measure of the exhibition's influence can be gained if we consider an extrapolation of that research finding to the over 45,500 individuals who saw the physical exhibition in Australia.

Secondly, the original artistic response to environmental threats posed by coal mining, which created the exhibition in 2012, has continued up to the time of writing in 2017. Through annual artist camps at the threatened Bimblebox Nature Refuge, and regular online presentation of the ongoing environmental and artistic issues connected to the protection of the Refuge, a continuity of collective artistic response has been maintained. The inspiring activist example provided by the groups of environmental artists who attending the Nature Refuge site had a strong social norm influence on the research sample of this study. Indeed, it can be argued that the 'place story' of the Refuge site, which the original artists set out to construct through their work, now includes the story of the artistic enterprise itself. This continuing narrative, linking environmental art practice to activist conservation will continue the influence of the exhibition, even though it completed its physical tour in March 2017.

Thirdly, the public response to the Bimblebox: art-science-nature exhibition points to a future direction for environmental art advocacy in community capacity building around sustainability issues. The physical exhibition was an exemplar of environmental art practice as a response to environmental threat, and in the service of providing scientific and cultural information, interpretation and education to the public linked to those environmental threats. The exhibition artworks invited audiences to reflect on the human relationship to nature, and, by implication, advocated for a society that can co-exist with the natural world in ecologically sustainable ways. From surveyed participant response it was clear that this

invitation to reflective thought about the human-nature relationship was taken up by many.

This finding was encouraging in so far as it pointed to one way of getting more of the public to engage more directly with sustainability issues. More direct public involvement is absolutely essential to counter the frequent lack of genuine community consultation and full, public participative involvement in sustainability policy formation; and an associated underselling of the benefits of sustainable development to communities. It has been suggested that this lack of stakeholder engagement (Howes et al., 2017) has been one of the prime factors in leading to public and political underestimation of the severity of environmental decline; and a perceived, but false dichotomy between environmental wellbeing and economic progress. Consequently, in many cases, there has active or passive resistance to required reforms that would more realistically balance the needs of social, environmental and economic development or 'people, planet and prosperity.'

An environmental art practice that has the ability to invite its audience toward critical and philosophical reflection on the core values and assumptions underpinning the functioning and progress of society itself is possibly the most valuable asset that the genre can bestow in the Anthropocene (Boulton, 2016; Latour, 2016). We inhabit an era of complex and contested discourses over what to do about the accelerating global environmental decline we are inducing; and at this point in history it would seem we need to be shown 'how to think' about this existential threat; and how to grasp the incomprehensible enormity of the environmental and social challenges we have created over the last few hundred years.

Through this research I have been persuaded that the environmental and sustainability crises of the Anthropocene era are problems produced by misguided narratives, inappropriate values and the inadequacy of representation of the non-human. Each of these issues are tied to areas of human culture which art practice can well illuminate and interrogate for public benefit. On the one hand, these issues can be experienced as overwhelming and anxiety provoking (Lertzman, 2012; Morton, 2013; Weintrobe, 2013). Indeed, this type of response

was clearly demonstrated by many Bimblebox research participants. Equally, however, the inspiring example and moral leadership of the artists who created the exhibition (Vianello et al., 2010) and the aesthetic pleasure generated by their artworks as they depicted the place story of the Bimblebox Refuge, was able to generate positive emotional response in some participants as well. It is such a positive emotional response (Fredrickson, 2004) that will help build the more expansive, consensual and strategic public engagement needed to counter the threats posed to nature everywhere.

At present, we are hidebound to the power of outdated narratives on human progress and economic development. The irrational and highly polarised narratives around coal mining in Australia offer a perfect example. Our dominant worldviews favour self-serving values such as wealth, consumption and hierarchy, over peace, social justice and environmental protection. The impotence and hypocrisy of government agreements to protect a nature refuge 'in perpetuity' but not from coal mining, is a reflection of the contested interplay and relative prioritisation of such values. Importantly, we have no serious means to represent the interests and rights to existence of other species or the biosphere. The certain devastation of the priceless faunal and botanical richness of the Bimblebox Nature Refuge, which would occur if proposed coalmining eventuates, offers a perfect example of this lack.

The Bimblebox: art-science-nature exhibition touched upon all of these misguided ways of pursuing the human-nature relationship, to greater or lesser extent; and achieved a significant audience response as a result. By extension, I pose a final, open question to any future researchers in the field of environmental art influence. I ask whether the impressive level of art advocacy influence achieved by the exhibition could be even further leveraged through the art-sustainability intersection already described. More specifically, could the public sustainability engagement resource embodied within environmental art practice, and as represented by art genres such as the Bimblebox exhibition, be more fully realised when it is matched, more systematically, with the collections, research and public educational

expertise of the museum sector; and when it harnesses the full presentational pull of the existing and emerging digital technology spectrum?

I will not attempt to answer my own question here but, in closing, offer an imaginary insight into how the art-sustainability intersection might contribute to the public sustainability engagement challenge.

6.4 A day in the future of the enhanced sustainability intersection

I end this work where I began in the preamble, with a person sitting in an armchair and responding to a form of environmental art imagery. Except now, in 2017, it is not a TV but rather a digital technology headset that is being used to view the art. And not just viewing in passé, 2-D, high-resolution, our contemporary environmental art lover is now engrossed in a 3-D, immersive virtual environment; a realistic representation of a natural world setting she may never visit in reality; incidentally saving a considerable amount of fossil fuel which would have been burned in transportation. It is not just a compelling entertainment that is being offered here. An empathic connection to this vividly drawn virtual world is being fostered by the multisensory data flow; and at the same time, educational content about the issues and problems faced by its real-world counterpart is also appearing. The presentation is linked to a major virtual exhibition and associated, free, online MOOC on biodiversity loss that is being hosted by a syndicate of museums across the world.

Such is the sense of realism and connection generated by the virtual reality world that, when the headset comes off, our virtual art lover decides to visit her local museum to gain further insight into biodiversity loss problems in her own area. A partner in the aforementioned syndicate, the local museum has provided an exhibition on regional biodiversity problems sourced from its own collections and research; and augmented by an environmental art exhibition, part-museum commissioned, part crowd-sourced and part crowd-curated from local artists and museum visitors. Once in the building, our virtual world

participant now engages with the experience of the environmental art on the walls and the designated collection provided by the institution; but is adding to this physical interaction using augmented virtual reality apps provided by the museum and downloaded to the personal Smartphone in her hand.

On the phone screen she watches and listens to a digital talking head presentation about the issues of local biodiversity loss and remediation, and resolves to make contact with some of the community groups who are working on this issue as recommended. At the same time, our visitor makes a number of recommendations back to the museum, by means of the phone app, on her interest and response to individual exhibits. She asks a question about the exhibition, and receives a reply within a couple of minutes. She wonders, momentarily, whether this feedback was provided by an algorithm or in real time by a human expert. As our imaginary visitor returns home to follow up on the contacts supplied, and register for the intriguing biodiversity and planetary boundaries MOOC she saw advertised, the tracking data collected by the museum through the ever-versatile Smartphone is already being added to its anonymous database.

The collective visitor data will provide a better understanding of public engagement and interest within the museum, both in general and regarding this particular exhibition. Visitor comments on object and art exhibit interest will help shape future curatorial decisions on presentations using the museum's collections and art objects. Analysis of random questions asked by visitors will aid this curatorial review. Eventually, the data on biodiversity MOOC registration and completion, and changes in local biodiversity community group membership, will feed through to give some indication of the social impact of this particular exhibition, and of the museum acting as a community hub.

The specific scenario just described is imaginary, but all of the elements of digital technology and museum practice described are already present globally and are being used, to a lesser or greater extent, to present artworks and cultural objects to the public in more

interesting and compelling ways, both inside and outside of the walls of museum and gallery venues. It is but a little stretch of the imagination to envision these early experiments in art, museum and digital technology intersection being used to put more environmental art in front of a lot more audiences, both real and virtual, in more compelling and engaging ways; and with the ultimate goal of fostering greater levels of pro-environmental behaviour and global citizenship toward sustainability adoption amongst those audiences. Here is a possible precursor to innovative practice in future environmental art advocacy dissemination. Such practice may afford environmental art advocacy the best opportunity yet to help close the twenty-first century environmental attitudes action gap. The imagined art devotee in the armchair will be one individual who is watching with special interest.

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APPENDIX A:

Table A1: *A simple comparison of environmental art and science functions*

ENVIRONMENTAL ART	**FUNCTION**
*Art as environmental education *The Bimblebox exhibition as a whole*	Art in the service of providing information, interpretation or education in regard to environmental problems.
*Art depicting natural forces *The natural materials used to make the Bimblebox artworks*	Art in the service of representing, and being directly shaped by, natural forces such as wind, water, the interaction of flora and fauna or even phenomena such as lightening or seismic activity.
*Art as a vision of human-nature relationships *The various 'place story' elements of the Bimblebox exhibition to generate empathic connection*	Art in the service of re-envisioning the human relationship to nature and proposing new ways for society to co-exist with the natural world and environment in ecologically sustainable ways.
*Art as scientific research *The use of various aspects of the scientific method in the approach to creating artworks*	Art in the service of undertaking artistic or scientific research into the processes and functioning of the natural world, from a macro to micro scale. This genre is particularly relevant to the contemporary evolution of art-science collaborative work
Art as environmental remediation	Art in the service of restoring damaged environments or remediating natural ecosystems in an aesthetic manner.
ENVIRONMENTAL SCIENCE	
Science in sustainability education	Science in the service of contributing to the knowledge and education of the public on environmental issues through environmental education and more recently, education for sustainable development.
Science explaining natural forces	Science in the service of contributing to the sophistication of our present understanding of the forces, systems and cycles of the natural world at a planetary down to local level. The impacts of human society: drawing together interdisciplinary insights from a range of the Earth, and more recently social sciences, now considered together to be part of the environmental humanities field.
Science used in environmental adaptation and remediation	Science in the service of contributing to precepts that have increasingly informed other, more specialised environment-oriented fields. For example, within climate science and natural resource management. Particularly as these fields have attempted to engage a wider public: with issues of ecological sustainability, and community adaptation and resilience in the face of growing, global environmental risks and impacts, such as those posed by anthropogenic climate change and biodiversity loss.

APPENDIX B:

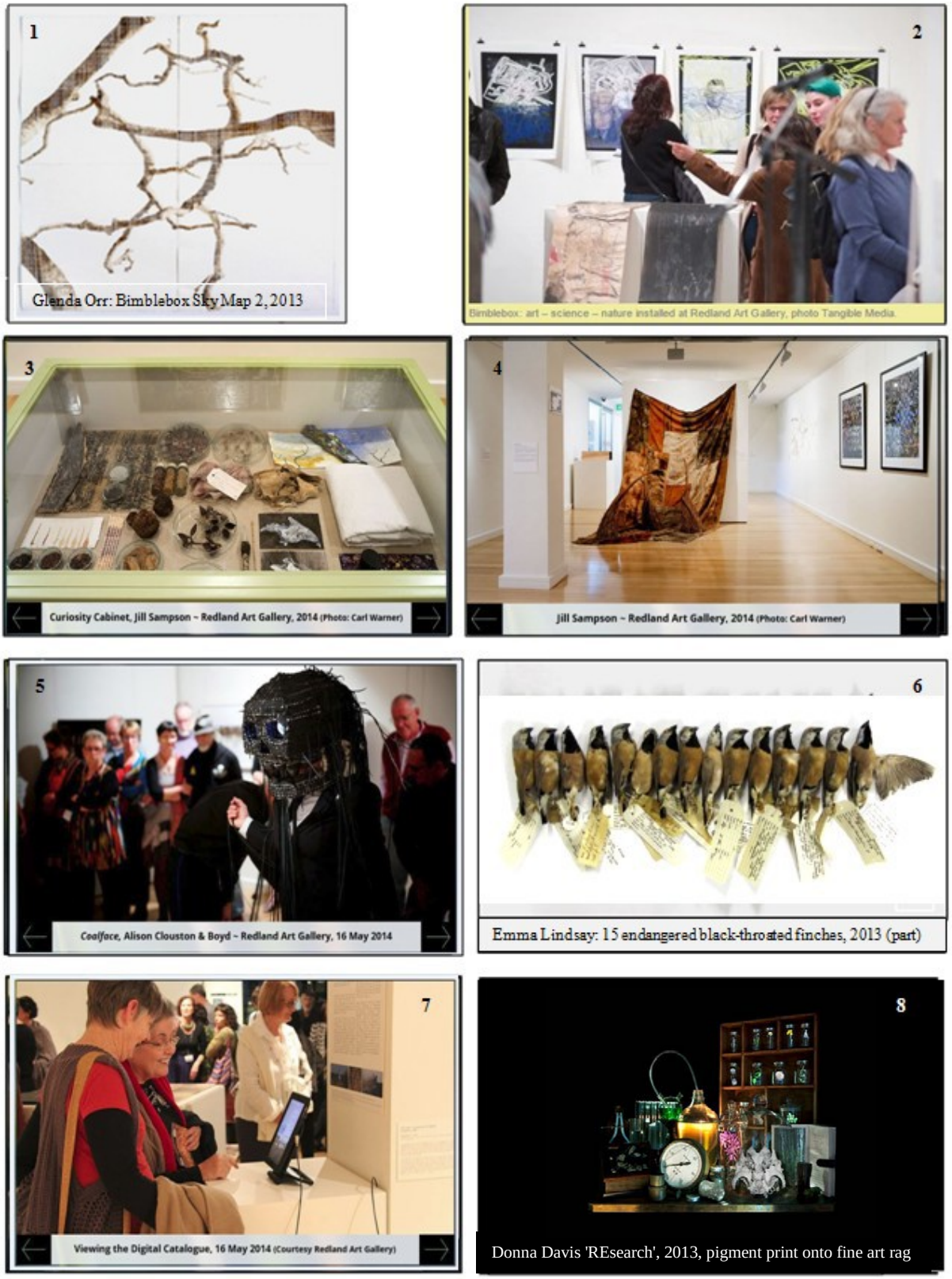


Figure B1: Images from the Bimblebox: art-science-nature exhibition 2014-2017

Note: Panel numbers refer to text references made throughout the thesis. Copyright of images courtesy of the respective organisations and artists: Glenda Orr, 1; Tangible Media/ Alison Clouston and Boyd/ Fiona Mac Donald/ Gerald Soworka 2, 5; Redland Art Gallery, 3,4,7; Jill Sampson 4, Emma Lindsay, 6; Donna Davis, 8 - courtesy of the artist - 'REsearch, 2013' pigment print onto fine art rag.

APPENDIX B:

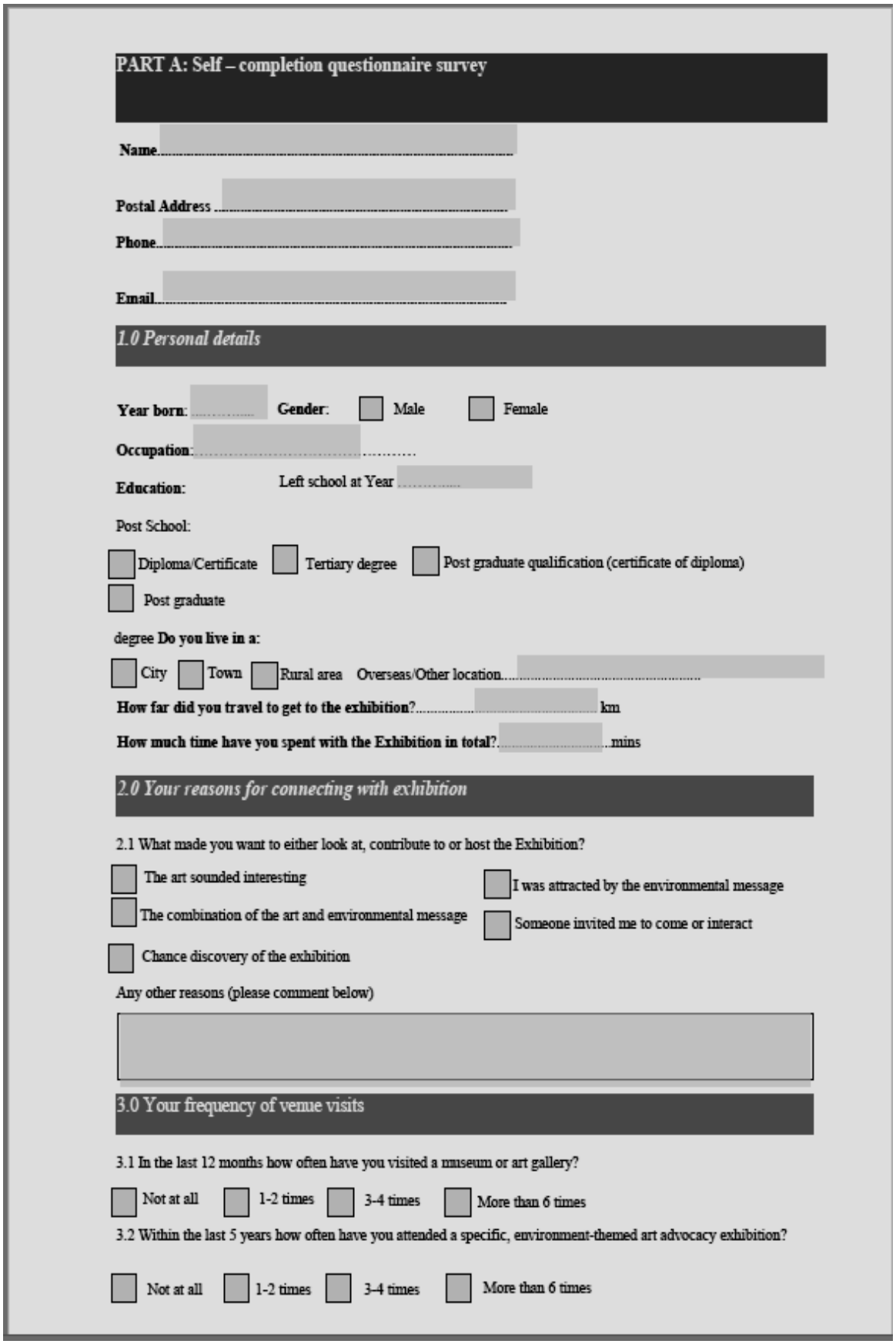
Table B1: *Bimblebox exhibition venues on its national tour 2014 - 2017*

Museum or Gallery Venue	Dates of the Bimblebox exhibition presentation
2014 Tour dates	
Redland Art Gallery, Queensland	18th May – 29th June 2014
Dogwood Crossing at Miles, Queensland	25th July – 23rd September 2014
Bunbury Regional Art Gallery, Western Australia	4th October – 23rd November 2014
Flinders University City Gallery, South Australia	5 December - 8 February 2015
2015 Tour Dates	
South Coast Regional Arts Centre, Goolwa, South Australia	17 February - 10 April 2015
Toowoomba Regional Art Gallery, Queensland*	18 April - 7 June 2015
Gladstone Regional Art Gallery/Museum, Queensland	27 June - 15 August 2015
Rockhampton Art Gallery, Queensland	29 August - 11 October 2015
Artspace Mackay, Queensland	23 October - 6 December 2015
2016 Tour Dates	
New England Regional Art Museum, New South Wales*	5 February - 24 April 2016
University Gallery Newcastle University, New South Wales*	4 May - 11 June 2016
Manly Art Gallery and Museum, New South Wales*	1 July - 4 September 2016
Logan Art Gallery, Queensland*	14 October - 26 November 2016
2017 Tour Dates	
The Condensery Gallery, Toogoolawah , Queensland*	11th February – 26th March 2017

Note: The cumulative total of visitors to the Bimblebox exhibition to the end of 2016 was recorded as 45,580 by the management organization Museum & Galleries Queensland (2016). The researcher visited the venues marked with asterisks during the residency of the Bimblebox exhibition at that location.

APPENDIX C:

Figure C2: Survey Part A questionnaire pro-forma



PART A: Self – completion questionnaire survey

Name.....

Postal Address .....

Phone.....

Email.....

1.0 Personal details

Year born: ..... **Gender**: ☐ Male ☐ Female

Occupation:.....

Education: Left school at Year .....

Post School:

☐ Diploma/Certificate ☐ Tertiary degree ☐ Post graduate qualification (certificate of diploma)

☐ Post graduate

degree **Do you live in a**:

☐ City ☐ Town ☐ Rural area Overseas/Other location.....

How far did you travel to get to the exhibition?..... km

How much time have you spent with the Exhibition in total?..... mins

2.0 Your reasons for connecting with exhibition

2.1 What made you want to either look at, contribute to or host the Exhibition?

☐ The art sounded interesting

☐ I was attracted by the environmental message

☐ The combination of the art and environmental message

☐ Someone invited me to come or interact

☐ Chance discovery of the exhibition

Any other reasons (please comment below)

3.0 Your frequency of venue visits

3.1 In the last 12 months how often have you visited a museum or art gallery?

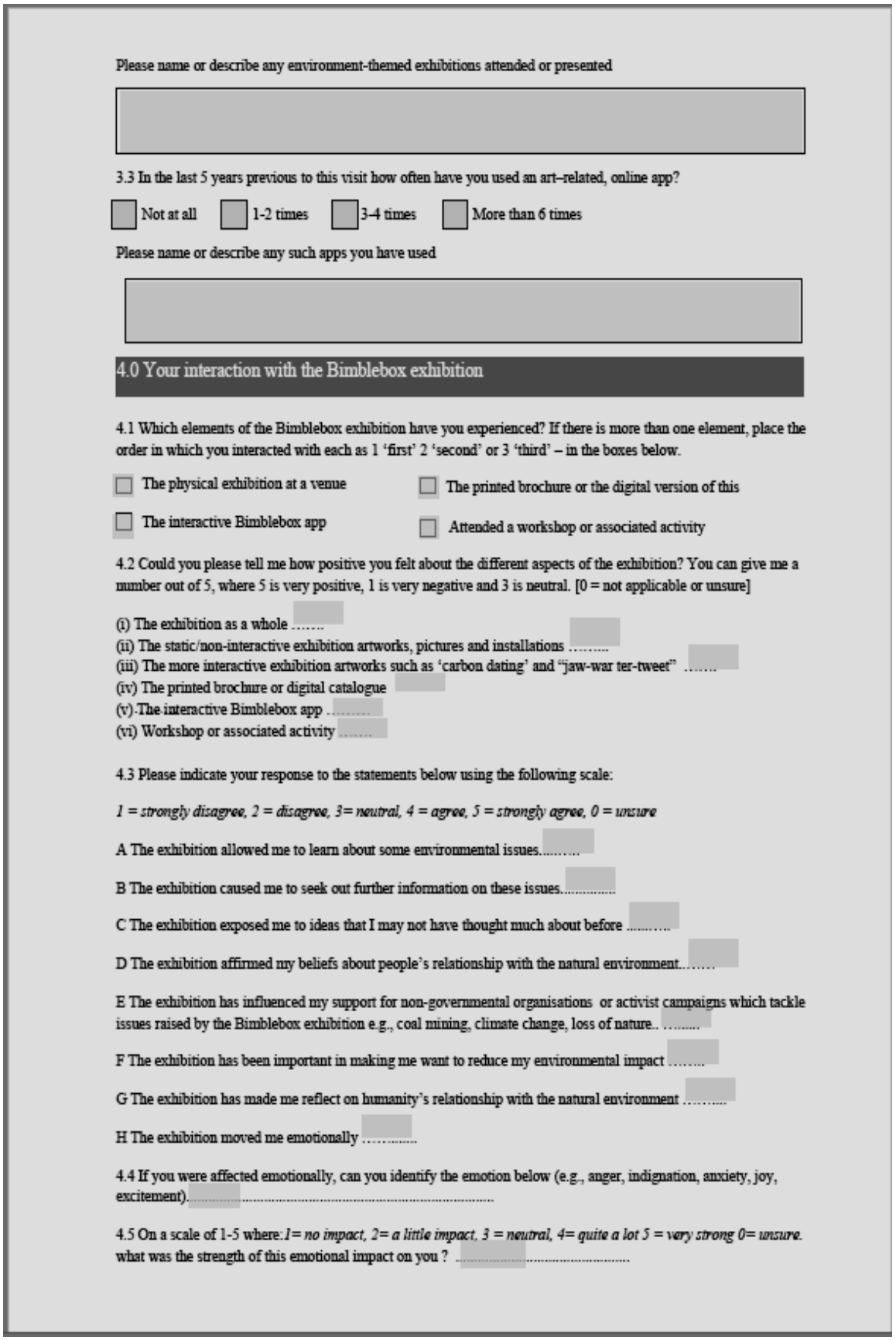
☐ Not at all ☐ 1-2 times ☐ 3-4 times ☐ More than 6 times

3.2 Within the last 5 years how often have you attended a specific, environment-themed art advocacy exhibition?

☐ Not at all ☐ 1-2 times ☐ 3-4 times ☐ More than 6 times

APPENDIX C:

Figure C2: Survey Part A quantitative questionnaire pro forma: page 2



Please name or describe any environment-themed exhibitions attended or presented

3.3 In the last 5 years previous to this visit how often have you used an art–related, online app?

☐ Not at all ☐ 1-2 times ☐ 3-4 times ☐ More than 6 times

Please name or describe any such apps you have used

4.0 Your interaction with the Bimblebox exhibition

4.1 Which elements of the Bimblebox exhibition have you experienced? If there is more than one element, place the order in which you interacted with each as 1 'first' 2 'second' or 3 'third' – in the boxes below.

☐ The physical exhibition at a venue ☐ The printed brochure or the digital version of this

☐ The interactive Bimblebox app ☐ Attended a workshop or associated activity

4.2 Could you please tell me how positive you felt about the different aspects of the exhibition? You can give me a number out of 5, where 5 is very positive, 1 is very negative and 3 is neutral. [0 = not applicable or unsure]

(i) The exhibition as a whole …….
(ii) The static/non-interactive exhibition artworks, pictures and installations ……..
(iii) The more interactive exhibition artworks such as 'carbon dating' and "jaw-war ter-tweet" …….
(iv) The printed brochure or digital catalogue
(v) The interactive Bimblebox app ……
(vi) Workshop or associated activity ……

4.3 Please indicate your response to the statements below using the following scale:

1 = strongly disagree, 2 = disagree, 3= neutral, 4 = agree, 5 = strongly agree, 0 = unsure

A The exhibition allowed me to learn about some environmental issues……..

B The exhibition caused me to seek out further information on these issues……

C The exhibition exposed me to ideas that I may not have thought much about before ……..

D The exhibition affirmed my beliefs about people's relationship with the natural environment……

E The exhibition has influenced my support for non-governmental organisations or activist campaigns which tackle issues raised by the Bimblebox exhibition e.g., coal mining, climate change, loss of nature.. ……..

F The exhibition has been important in making me want to reduce my environmental impact ……..

G The exhibition has made me reflect on humanity's relationship with the natural environment ……..

H The exhibition moved me emotionally ……..

4.4 If you were affected emotionally, can you identify the emotion below (e.g., anger, indignation, anxiety, joy, excitement)……

4.5 On a scale of 1-5 where:*1= no impact, 2= a little impact, 3 = neutral, 4= quite a lot 5 = very strong 0= unsure.* what was the strength of this emotional impact on you ? ……

APPENDIX C:

Figure C2: Survey Part A quantitative questionnaire pro forma: page 3

4.6 Did viewing the exhibition affect you in some other way not described above? Please comment below.

4.7 Please indicate any environmental themes that you are more aware of after viewing the exhibition using the following scale:

1 = had no effect on my awareness, 2 = had little effect, 3= neutral 4 = had a noticeable effect on my awareness, 5 = had a strong effect, 0 = unsure

(i) Ways of managing the land sustainably – balancing agriculture with nature conservation.....
(ii) The potentially destructive impacts of coal mining .....
(iii) The value of nature refuges and how they protect diminishing native plant and animal life.....
(iv) Ways of managing groundwater use within a recharge zone for the Great Artesian Basin .....
(v) Ways that mining development can affect the lifestyle of regional communities.....
(vi) Human influenced climate change .....

5.0 Your response to selected art works.

5.1 Please indicate the Bimblebox exhibition artwork that had the strongest impression on you.

.....

5.2 Why was it so engaging or memorable for you? (If necessary, you can refresh your memory using the digital images of the exhibition in either the paper or online catalogue.)

.....

5.3 What do you think is the main message for you, in the work of art you have selected?

5.4 Now thinking about the artwork you selected, please answer the following questions using this scale:

1 = not at all important, 2 = slightly important, 3 = neutral 4 = quite important, 5 =very important, 0 = unsure

How important would it be for you to share an image of this artwork with friends on social media?.....

How important would this image be in making someone else feel like the issues represented in the exhibition are more urgent rather than less urgent problems? .....

How important might it be for others to share this image on social media or talk about it with their family and friends? .....

How important could this image be in making someone else supportive of non-government organisations or conservation activist campaigns to reduce dependency on coal — and therefore better protect our climate, wildlife and groundwater supplies? .....

APPENDIX C:

Figure C2: Survey Part A quantitative questionnaire pro forma: page 4

6.0 Your level of environmental activity and intentions

6.1 In the following list of possible activities - and by placing a tick in the box - can you please indicate for each activity, in the 12 months BEFORE seeing the Bimblebox exhibition, if you have often done that, sometimes done it, just occasionally done it or never done that activity.

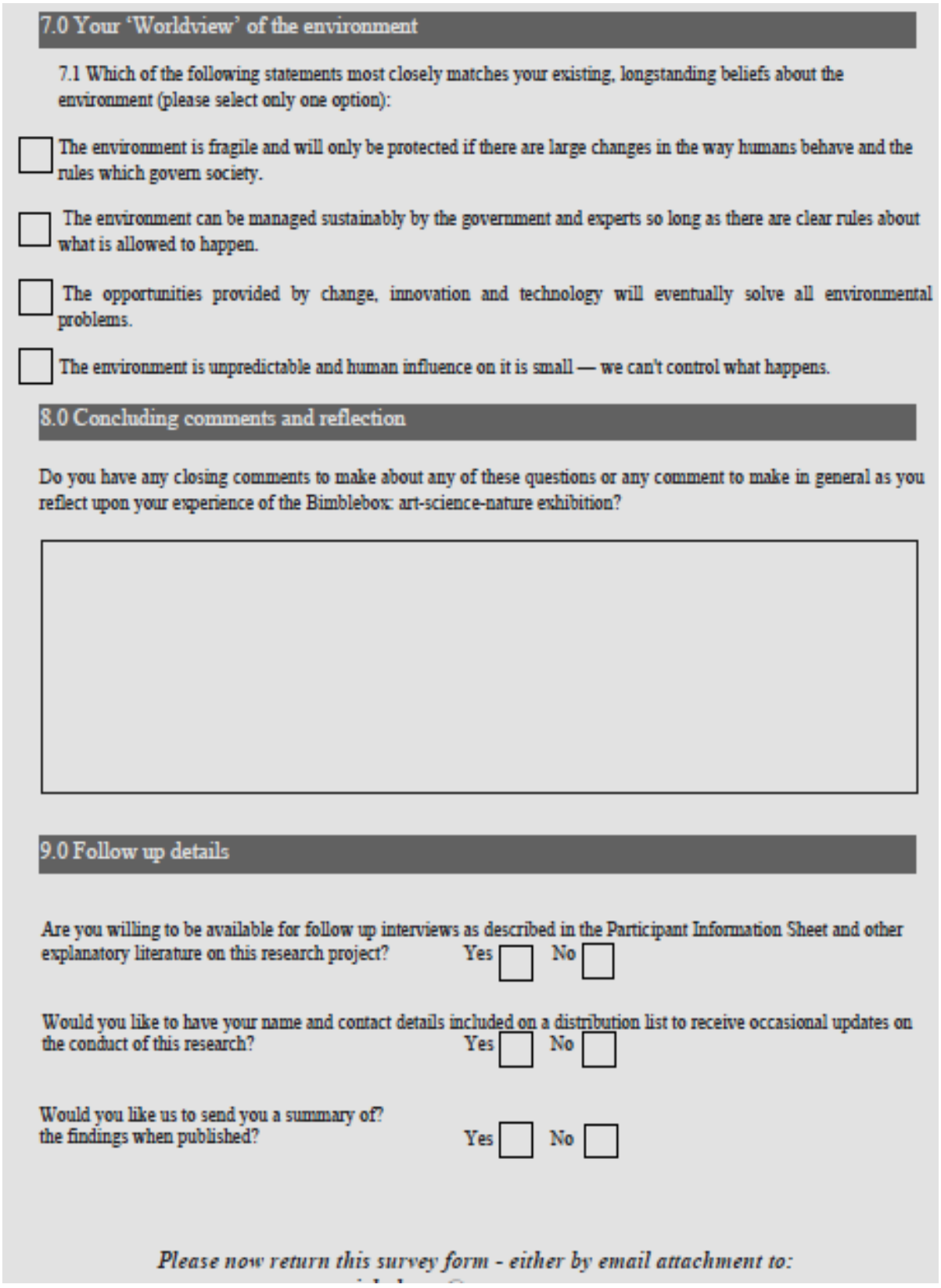
Action	Often	Some-times	Occas-ionally	Never
Decided for environmental reasons to re-use something instead of throwing it away	☐	☐	☐	☐
Avoided plastic bags to carry shopping home	☐	☐	☐	☐
Composted food and/or garden refuse	☐	☐	☐	☐
When doing the shopping, tried to avoid products with lots of packaging	☐	☐	☐	☐
Chosen products that you think are better for the environment	☐	☐	☐	☐
Made an effort for environmental reasons to reduce water consumption	☐	☐	☐	☐
Taken active steps to reduce energy consumption, turning off lights, using home heating and cooling more efficiently - Purchasing energy-efficient appliances or light globes	☐	☐	☐	☐
Taken active steps to reduce fuel consumption and vehicle air pollution	☐	☐	☐	☐
Tried to get information on some topic that you thought was relevant to protecting the environment	☐	☐	☐	☐
Participated in local development or environmental issues with the aim of protecting or improving the environment. For example, by writing a letter, attending a meeting, making a report or complaint or being on a committee.	☐	☐	☐	☐
Been involved in a public environmental event - such as a protest rally, activist workshop or an environment- themed artistic performance	☐	☐	☐	☐
Given money to a campaign or NGO group or charity trying to save something to do with the environment	☐	☐	☐	☐
Taken part directly in a local conservation activity – such as a bushland working bee?	☐	☐	☐	☐
Taken part in an on-line, cyber environment campaign e.g. through 'Avaaz'	☐	☐	☐	☐

6.2 Is there any environment activity or activities missing from this list which has been important to you over the last 12 months prior to you viewing the exhibition? If so please describe this below

Please use the box below to make comments about any future environmental activity intentions you may have at this time after having interacted with or seen the Bimblebox exhibition.

APPENDIX C:

Figure C2: Survey Part A quantitative questionnaire pro forma: page 5



7.0 Your 'Worldview' of the environment

7.1 Which of the following statements most closely matches your existing, longstanding beliefs about the environment (please select only one option):

☐ The environment is fragile and will only be protected if there are large changes in the way humans behave and the rules which govern society.

☐ The environment can be managed sustainably by the government and experts so long as there are clear rules about what is allowed to happen.

☐ The opportunities provided by change, innovation and technology will eventually solve all environmental problems.

☐ The environment is unpredictable and human influence on it is small — we can't control what happens.

8.0 Concluding comments and reflection

Do you have any closing comments to make about any of these questions or any comment to make in general as you reflect upon your experience of the Bimblebox: art-science-nature exhibition?

9.0 Follow up details

Are you willing to be available for follow up interviews as described in the Participant Information Sheet and other explanatory literature on this research project? Yes ☐ No ☐

Would you like to have your name and contact details included on a distribution list to receive occasional updates on the conduct of this research? Yes ☐ No ☐

Would you like us to send you a summary of? the findings when published? Yes ☐ No ☐

Please now return this survey form - either by email attachment to:

APPENDIX C:

Figure C3: Part B semi structured interview questions

Survey Part B – Semi-structured interview questions for narrative interview

Preamble:
In order to get our conversation going, I am going to ask you a series of questions which all link, really, to a central question. What is/has been the 'story' of your involvement in this exhibition? In other words, I want to get more detail from you on the who, what, where, why and how of your time spent with the exhibition - and any influence or effect you think it has had, or will have on you. I will encourage you throughout to speak your mind; even suggesting questions for **me** if they occur to you, and which help direct the course of the interview onto topics that seem of most personal relevance as you recall your experience with the Bimblebox exhibition.

Generic questions for entire research population at baseline survey:

1) In general terms, what did you think you got out of your interaction with the Bimblebox exhibition or its various other elements – its catalogue, app, or workshops?
Prompt if required: reference to some of the relevant responses given in the Survey A pro- forma

2) If you saw more than one element, was there any difference in the experience you had with those elements? In other words, might the overall physical exhibition have had more or less of an effect on you than, say, the paper or electronic catalogue or app? Or might it be the other way around? Or is it not possible to say?
Prompt if required: RP responses given in Survey Part A to questions 4.1

3) Do you think that the exhibition has or has not had a specific influence on the way you respond to the environment or nature in general? Can you say more about this? What I am interested in here is whether you think you might or might not end up doing something new or differently for the environment. For example, do you or don't you have any future intentions toward undertaking some environmentally supportive behaviour as a result of viewing the exhibition?
Prompt if required: seek response about initial or subsequent baseline environmental behaviours profile given in question 6.1 of the Survey Part A pro-forma.

4) Do you want to say anymore about why you hold this belief? For example, what things do you think might assist you, or have assisted you, in undertaking environmentally supportive behaviour recently – and what do think might hold, or has held you back from making changes?
Prompts if required (but used sparingly): Draw upon any RP comments at questions 6.2 on the Survey A form. Some examples of things to cite/test for could be:
Positives: your own established mindset, personal curiosity, determination, self-discipline. The support of those around you. *Negatives*: Lack of time/ too busy/distracted, low priority/too expensive. General lack of drive, interest or motivation/ apathy (if so why?)

5) Given your experience with the Bimblebox exhibition: in your opinion is there a future role (or not) for environmental art exhibitions like this one to play in the community? By which I mean - in getting communities more on side with the sort of environmental problems and risks represented in the exhibition or increasing public engagement with these sorts of issues?
Prompts if required: naming Bimblebox exhibition environmental themes portrayed and as listed at question 4.7

7) What worked well for you in the Bimblebox exhibition in engaging your interest, and what did not work so well toward achieving that result?

8) Overall, was there anything missing in the experience for you – if so what? Is there anything that could be or should be done differently to increase the level of public interaction with this type of exhibition in the future?

9) In closing do you think there are there any questions missing from this interview so far – and if so what are they?

Question for 6 and 12 months follow up (common to all three research participant groups) Generic to audiences, artists and curators – acting as environmental citizens

10) After this time elapsed (6 or 12 months) how would you now describe the way you think or feel about your experience of the Bimblebox exhibition? For example, in terms of how that experience might have connected with anything that has happened to you over the last 6 months in regard to the natural environment – for instance in terms of any stated intention towards supportive environmental behaviour?
Prompt if required: for example: new exhibitions encountered/environmental actions undertaken

11) Do you think your environmental behaviours profile listing/scoring might have changed or not – that is, as compared to your original Survey A survey responses? If the listing has changed in either a more motivated or less motivated direction (i.e., regarding environmentally supportive behaviour) can you say something about that? Equally if the listing hasn't changed at all - can you also say something about that?
Prompts if required: refresher on original listing and direction of any change as percentage score calculation - any statement of intent from Survey Part A1 and A2 pro-forma – with comparison given by researcher

12) Given the time elapsed since your experience with the Bimblebox exhibition (6 or 12 months) – what do you think now about the future role that environmental art, as in the Bimblebox exhibition, might play in helping engage communities with urgent environmental issues such as those represented through the exhibition?
Prompt if required: refresher/reminder from transcribed notes of previous interviews

13) What role, if any, do you think being involved in this systematic research process has had on your response to the Bimblebox exhibition? For example, do you think you might have thought or felt differently about the artworks, or been motivated or acted differently in pro- environmental ways if you had not been interviewed about the exhibition by a researcher? *Prompt if required: explain to RP about the possibility of influence and bias that can be introduced into any form of research by the assumptions and approach of the researcher.*

Specifically, for Museum and Gallery staff – as representatives of their sector

12(a) What might the future hold for the role of your institution, and the wider Australian museum and gallery sector, in providing an active engagement space that connects local audiences and wider communities with ecological sustainability issues and environmental problems and risks?
Prompt RP's at 12 month, round three survey using cueing material from the dedicated Resources Essay and associated semi-structured questions – see Appendix C, Figure C4

13) What role, if any, do you think being involved in this systematic research process has had on your response to the Bimblebox exhibition? For example, do you think you might have thought or felt differently about the artworks, or been motivated or acted differently in pro- environmental ways if you had not been interviewed about the exhibition by a researcher? *Prompt if required: explain to RP about the possibility of influence and bias that can be introduced into any form of research by the assumptions and approach of the researcher.*

Specifically for Bimblebox contributing artists - as representatives of their sector

12(b) What might the future hold for the role of environmental art practice in providing resources for an active engagement framework that connects local audiences and wider communities with ecological sustainability issues and environmental problems and risks?
Prompt RP's at 12- month, round three survey using cueing material from the dedicated Resources Essay and associated semi-structured questions – see Appendix C, Figure C4

13) What role, if any, do you think being involved in this systematic research process has had on your response to the Bimblebox exhibition? For example, do you think you might have thought or felt differently about the artworks, or been motivated or acted differently in pro- environmental ways if you had not been interviewed about the exhibition by a researcher? *Prompt if required: explain to RP about the possibility of influence and bias that can be introduced into any form of research by the assumptions and approach of the researcher.*

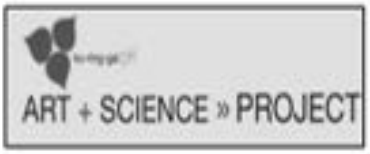
14) In your view are there any questions missing from this interview so far – and if so what are they?

APPENDIX C:

Reproduction of the resources essay supplied to research participants as noted in thesis text

Where to from here?

Future opportunities for the museums sector and environmental art to engage the public with triple bottom line sustainability – a survey resource for use with Bimblebox: art-science-nature research participants



Contents:

Resources Essay:

Contents:

Introduction

I have been studying the public sustainability engagement potential of the museum and gallery sector, in conjunction with environmental art presentation, both in Australia and internationally. And I have come increasingly to a conclusion, in company with a number of other commentators, that this intersection of art and museology practice holds considerable untapped potential: to provide influential educative resources and additional space for public sustainability and global citizenship education; and thereby to help build capacity toward the pro-active engagement of civil society in the urgently needed, but hitherto largely thwarted transition toward an ecologically sustainable future.

Put another way, my recent reading of the professional and academic literature suggests strongly that the museum and gallery sector, working closely with evolving artistic practice in such areas as environmental art-science collaboration, can build on its existing good work in the field of public sustainability engagement. More precisely, it can make a stronger contribution to the crucial problem of closing the environmental attitudes-action gap. That gap constitutes the growing divergence between what we know, scientifically, is needed to halt global environmental degradation – and what is actually taking place on the ground most of the time. The various reasons for the under achievement of traditional forms of sustainability engagement to move us toward the goal of closing this gap within an adequate timeframe are still being researched, but some drivers of the impasse have already been clearly identified.

One proposed causative factor of the problem of 'the Gap' is a lack of genuine community consultation and full, public participative involvement in sustainability policy formation; and an

associated underselling of the benefits of sustainable development to communities. In turn, it is suggested that this has led to public and political underestimation of the severity of environmental decline; a perceived, but false dichotomy between environmental and economic progress, and consequently, in many cases, active or passive resistance to required reforms that would more realistically balance the needs of social, environmental and economic development or 'people, planet and prosperity.'

This latter, enduring sustainability triumvirate is also designated within the concept of the 'triple bottom line' one of the surviving legacies of the 1990s golden age of ecological sustainability promotion. Late in that decade the concept was operationalised within the internationally acknowledged business standards set by the Global Reporting Initiative, which has been influential on Australian museums, as elsewhere, within the last 15 years or so? Globally, the museum sector, with its massive physical community and on-line presence, and it's still evolving ethos for public service, facilitative education and community outreach, is theoretically well placed to provide some novel forms of public sustainability engagement that could help tackle the problem of the attitudes-action gap. In fact, a related idea to: 'provide forums for the presentation of new knowledge and the debate of important sustainability issues' was mooted as long ago as 2003 by the Museums Australia organisation in its sustainability adoption policy for the sector presented that year.

I go on to describe some of the bigger picture trends in the intersection between environmental art and the museum sector as revealed by literature review shortly. Amongst other things, I have been curious to compare some of those trends and themes with the perceptions of the contributing artist and curator cohorts in my current research; and in order to contextualise the views of this Australian microcosm of the global intersection between audiences, environmental exhibited art, and the museum and gallery sector which house it. By way of providing some background to this conception of an intersection between the two fields of practice I refer you to a couple of accompanying graphics. In *Figure 1: Some current art, museology and sustainability intersections,*
I have set out my sense of some of the contemporary synergies. The second graphic, *Figure 2: Some environmental art, museology and cultural trends timelines 1970s* – gives my take on some of the key milestones for Australian environmental art, and the pre-cursors to museum environmental sustainability adoption since the 1970s.

Some tentative findings from the Bimblebox exhibition research work

My case study research of Bimblebox: art-science-nature is due for official completion in January 2018. Subject to statistical analysis one working hypothesis within the research has been that the findings will verify those on environmental art influence from published studies. Those findings point to the ability of environmental art advocacy to influence subsequent environmentally supportive behaviour in a significant proportion of the audiences who view it. Whilst my findings await final publication, the results from the few published studies could be cited to support the hypothesis that more than half of the over 45,500 people who saw the Bimblebox exhibition would have experienced some form of environmentally supportive influence from it. In turn this bolsters a belief in the leverage that could be exerted onto public environmentally supportive behaviour by the art and museology nexus; and the contribution that this could make to help close the attitudes-action gap.

My research observations and tentative findings have been very encouraging to date and, with your help, I am eager to complete this project so that its findings may be added to the limited research field on this topic; and perhaps be of future practical use in some way to artists and museum sector professionals. The published research findings I have mentioned and which I

reference later in this essay, coupled with insights gained from relevant professional and vocational writing, has lead me to a further hypothesis. That putting more environmental art, more frequently, into more museum and public spaces, both virtual and online, would advance the development of a more pro-active, environmentally and scientifically literate civil society. One well-fitted to engage in the enhanced forms of community consultation envisaged above. My associated proposition is that the implementation of such a goal is not only urgently required, but is almost certainly achievable due to its alignment with the existing capacities, trends and professional thinking of the museum sector internationally. It seems to me that the sector is already moving toward greater, public triple bottom line sustainability engagement on a number of fronts – it is the too slow a pace rather than the existence of such change that is the key issue here.

Existing capacities and attributes of the museum sector that can assist public engagement with sustainability issues

One simple but obvious place to start is with the huge scale of the museum sector internationally. One official museum listing registered 55,000 institutions in 2014. In Australia, the most recent official statistics I could locate recorded a museum establishment of over a 1000 venues in 2008, and a high physical and online audience engagement with the sector at that time. Specifically, 17.8 million admissions to Australian museums were noted for 2007/2008, as were 51.5 million 'unique online visits' demonstrating a cross-over of digital and physical museum visitation even by that date. The trends for both forms of museum engagement at that point were noted as having increased on previous periods of survey. In the United States, the American Alliance of Museums recently recorded 850 million museum visits being made annually. According to the Alliance, the trend in the US has also been for a substantial increase in both physical and online visitation rates to museums in that country. In the UK, just eight major London museums received 39 million visitors between them in 2016. Equally, however, the UK Museums Association has reported the effect of austerity measures in that country, resulting in an estimated 30% reduction in real expenditure across the sector in recent years and the closure of at least 64 museums there since 2010.This is a graphic example of a recurring theme of reducing public expenditure on the sector internationally.

Notwithstanding the vagaries of funding volatility and visitor statistical categories, this casual survey of audience engagement for just three countries over the last 10 years or so reveals a minimum of 900 million physical visits to museums annually, let alone the online visitation which is almost certain to be significantly higher than that figure. The opportunity for triple bottom line sustainability engagement provided by such a huge audience is obvious. When we combine a snapshot of the level of patronage of the sector with some of its widely acknowledged, existing strengths of public engagement, its potential to help transition society to an ecologically sustainable future becomes, I think, unprecedented. Museums are well regarded: as respected sites of informal public education , as trusted sources of unbiased information in a 'post-truth' world and in terms of their origins, as places of the 'muse.' They are places which can serve diverse values for audiences in a frenetic modern society; by being rare places for contemplation, critical thinking and social and cultural connection.

Sustainability engagement and new museology interests

Given all of these qualities it is perhaps hardly surprising that the museum sector has garnered recent increased attention as an important resource for community capacity building toward environmental sustainability adoption. From my reading, it seems to me that this interest has evolved, quite logically, from longstanding dialogue within the sector itself.

Commencing in the 1970s, ongoing professional discourse about the precise form and purpose of public engagement by the sector helped catalyse, over a thirty year period, the appearance of

a 'new museology' framework including elements of a public service, outreach, social justice and visitor participative engagement ethos. That framework was also shaped in response to a myriad set of interacting economic, political, social and technological changes that have influenced and impacted the sector. These influences included the sustainable development agenda, with its aspiration for a genuine integration of economic, environmental and social justice issues.

The conceptualisation of ecologically sustainable development, and the education for sustainability required to promote it, first rose to widespread public prominence in the early 1990s; and was incorporated into Australian museum policy interests by 2003.The main sustainability principles to be advanced since then in Australian museums seems to have prioritised better environmental management of venues with a focus on energy efficiency and waste reduction. This type of 'Green' museum initiative is a great advance but, conversely, other strategic sustainability proposals envisaged in 2003 seem to have achieved less prominence. For example, the public education and facilitation proposal that museums: 'provide forums for the presentation of new knowledge and the debate of important sustainability issues such as reconciliation, poverty, population, global warming and biodiversity.' In my view, this early vision statement links directly to the enhanced forms of public sustainability engagement already described in this document.

Professional development themes aligned with sustainability adoption
Some of the key themes researched within the literature on international new museology practice have been well represented in two, recent Australasian professional sector conferences referenced below. Each of the conference themes, given in bold text, could be considered to have direct relevance to public engagement with sustainable development needs, and additional comments have been added by the author to clarify that connection.

Firstly, from The Museums Australasia 2016 conference - Facing the Future: Local, Global and Pacific possibilities, held in Auckland, New Zealand, some relevant themes were:

1) Arts and sciences 'cohabitation' and the bridging of art and science.
As an Australian scientist working on a national environmental art-science collaborative project pointed out recently: *both science and art advance through moments of creativity. They involve research and experimentation, the possession of specialist skills that are refined over years, and a passion to communicate. Art and science change perceptions, produce emotional responses, and force us to question ourselves and our place in nature*. This theme also links to a related interest in the public environmental and sustainability communication benefits of 'transdisciplinary' science and its links to the environmental humanities field .

Within museum venues themselves, cross-disciplinary perspectives informing the use of art, objects and collections to engage the public with complex or 'wicked' sustainability problems, such as human-induced climate change is being advanced as an important recent addition to new museology practice on the environmental bottom line. Another linked issue here is the role of museums in helping develop more holistic public communication and scientific understanding of sustainability issues, such as climate change. This topic was explored in a major, 2011 Australian-lead research project which: *interrogated the roles of cultural institutions in climate change as places to provide information, and activate and broker discussions and decisions around climate change issues, locally and transnationally.* This latter research focus seemed very much in line with the Museums Australia 2003 policy statement already mentioned, and went on to suggest that: *the big task of the museum sector is not only to inform publics on the science of climate change but also to equip citizens with tactical knowledge that enable*

participation in actions and debates on climate change that affect their futures. The findings from this research also offered pragmatic guidance on how the museum sector could better respond to this sustainability engagement challenge.

2) Evaluating public value and impact.
There are several interacting issues to consider here, SROI metrics and their implications being one. There is also the related impetus, in some quarters, to orient museum missions in terms of a pragmatic community service ethos; one that generates positive social impact, and in light of the conviction that 'museums change lives.' The UK Museums Association has been particularly active in this regard over the last couple of years and has provided some recent national case studies of that philosophy in action. Some of this new work was stimulated by findings from the Association's major canvas of the UK museum sector in 2012, during its Museums 2020 Discussion Paper project. In Australia, a substantial professional focus on various aspects of the public value and impact of the regional museum sector has also been occurring in the last few years. A good example is provided by the Museum and Galleries Queensland 2015 conference with its key theme of public participation and community engagement and its 2016 seminar series 'Imagining a Future'

3) Design, technology, accessible sciences and digital engagement.
Again, there is a mixed bag of issues here but the future potential seems immense, based upon some recent museum experiences and as suggested by the perspective from a recent Australian environmental art-science collaborative project that: *the ongoing convergence of art and technology in the digital age has produced a new type of cultural provocateur who challenges the status quo, instigating and provoking new thoughts and actions*. One trend here is in the digitisation of museum collections to reach a wider audience in more compelling ways. For example, in ways that are more adept at communicating more complex scientific or environmental ideas, or even developing empathy for the natural world. The advent of 3D, Virtual Reality and Augmented Virtual Reality applications are already being embraced by larger museum venues. Still in its infancy, and with resourcing, creative copyright and other concerns notwithstanding, this aspect of museum operations is set to remain high on the list of audience engagement considerations over coming years. Another major issue of relevance is the likely 'virtual' amalgamation of the GLAM sector through greatly increased public online access across all constituent organisations within the sector spectrum. This trend is expected to reduce public perception of former cultural distinctions between, say, galleries and museums at point of public online access.

Engagement with local communities; audience participation; knowledge-sharing, and crowd-sourcing. One major anticipated area for future public engagement with environmental sustainability issues must surely lie within the citizen science movement. In Australia this initiative has a goal to: 'encourage and promote broad and meaningful participation of society in citizen science so people become partners in creating science and increasing science literacy.' The potential for this particular form of public participation and crowd sourcing support to value-add to museum and university research programs has been recognised through recent Australian government support and a major Australian Museum initiative launched in 2015.Another area of community engagement in regards to social bottom line initiatives is in the role that the museum sector may be able to play in the promotion of people's wellbeing, for example in terms of mental health enhancement through positive psychology and social networking. The UK's Happy Museum project, launched in 2011, provides an early example of this approach.

Museums of the future – we are now starting to see the appearance of individual, specialist museums solely dedicated to educating and facilitating public audiences on aspects of triple

bottom line sustainability. The Hong Kong Museum of Climate Change, which opened in 2013, was an early example, and a proposed climate change museum for New York waits in the wings to *serve as a hub for climate engagement and leadership in a challenging world.*
More recently, we have seen the Biomuseo in Panama (2014) dedicated to presenting the importance of that country's contribution to global biodiversity; and, perhaps the current jewel in the crown of the new museum generation focussed on sustainability issues: the Museum of Tomorrow (2015) built in Rio De Janeiro, Brazil, with its focus on sustainability education themes in the context of the Anthropocene era of accelerating environmental deterioration.

This idea of a museum becoming, in effect, a permanent space for triple bottom line public sustainability engagement, through the use of its exhibitions, collections and human resources is an inspiring one. It also resonates with the findings of the few published, academic studies that point to the value of using environmental art advocacy as an important source of cultural material that has the ability to influence public audiences towards more environmentally sustainable behaviour. The work of Curtis et al. (2014), with its meta-analysis and theoretical model proposal on the influence of a diversity of environment-oriented artistic practices, stands as a formative contribution to the field. The work of Marks et al. (2015) has also been notable in seeking to explore the response of audiences to public environmental art installations.

Arts, health and wellbeing, collaboration, activism, action for the environment, community and cultural issues
This last theme comes from the Museums Galleries Australia National 2017 conference: Museums and Galleries in their Cultural Landscapes, held in Brisbane in May 2017.This event had a number of audience engagement themes which overlapped with the 2016 conference, but was notable for this particular one, linking Green environmental citizenship to social wellbeing and community and culture; and hence echoing the classic, sustainable development concept of the triple bottom line as already described. The museum practitioner and academic Douglas Worts made some of the same points in his 2016 paper - Museums: Fostering a Culture of Flourishing

Museums have great, untapped potential to contribute to a world that is environmentally responsible, socially and economically equitable, as well as culturally engaged... this is the potential that I see for museums, to evolve new functions and forms for themselves that could help catalyse cultural change capable of fostering community dynamics designed to be increasingly sustainable, even leading to 'a culture of flourishing'!

Douglas Worts (2016)

A final view on sustainability engagement from a museum sector iconoclast
The structure of this essay has been based, loosely, on a past, present and future framework. I now want to leave you with the impassioned comments of a long standing and internationally acknowledged museum professional as he envisions the future of the sector in regard to public sustainability engagement. The former Canadian museum director, journal editor and now museology academic, Robert Janes, is forthright in his views. Janes was one of the keynote speakers at the Museums Australasia 2016 conference in the segment 'Future focus and sustainability for museums' and his seven-minute video address to the conference, starting about seven minutes into the clip is well worth watching. The following comments are taken from a 2010 paper by Janes on the theme of the future role of the museums sector in relation to sustainability adoption entitled the Mindful Museum. In the interval before we hold a semi-structured interview discussion, I ask you to reflect on these comment by Janes:

Are museums mindful of what is going on in the world around them? The planet Earth and global civilization now confront a constellation of issues that threaten the very existence of both. There is a burgeoning literature that offers dire warnings and solutions, but museums are rarely, if ever, mentioned. Are not museums (with the possible exception of contemporary art museums) the self-proclaimed custodians of posterity, assuming that the responsibilities of today will be the gifts of the future? If so, there is an alarming disconnect between this belief and the trajectory that many museums are on, preoccupied as they are with the marketplace, quantitative measures of performance, and internally driven agendas devoted to collecting, exhibiting, ancillary education, and entertainment. Rethinking the role of museums as social institutions will require no less than a reinvented museum—a mindful organization that incorporates the best of enduring museum values and business methodology, with a sense of social responsibility heretofore unrecognized.

The meaning and value of enhanced mindfulness have yet to be tapped by the museum community at large, and its potential might well be limitless. For those boards and museum workers who are disturbed at the thought of rethinking their traditional role and responsibilities, one question remains. How is it that museums, as social institutions, may remain aloof from the litany of socio-environmental issues that confront us, when many of these issues are intimately related to the purpose, mission, and capabilities of museums as we know them? This is not a call for museums to become social welfare agencies or Greenpeace activists, but rather to heighten their awareness and deliberately coalesce their capabilities and resources to bring about change, both internally and externally. Margaret Wheatley
writes: ‘‘There is no power for change greater than a community discovering what it cares about.’’ Will communities continue to care about museums in their current guise? Will museums discover what they care about? Or are museums at risk?
Robert Janes (2010)

Figure 1: SOME CURRENT ENVIRONMENTAL ART, MUSEOLOGY AND SUSTAINABILITY INTERSECTIONS

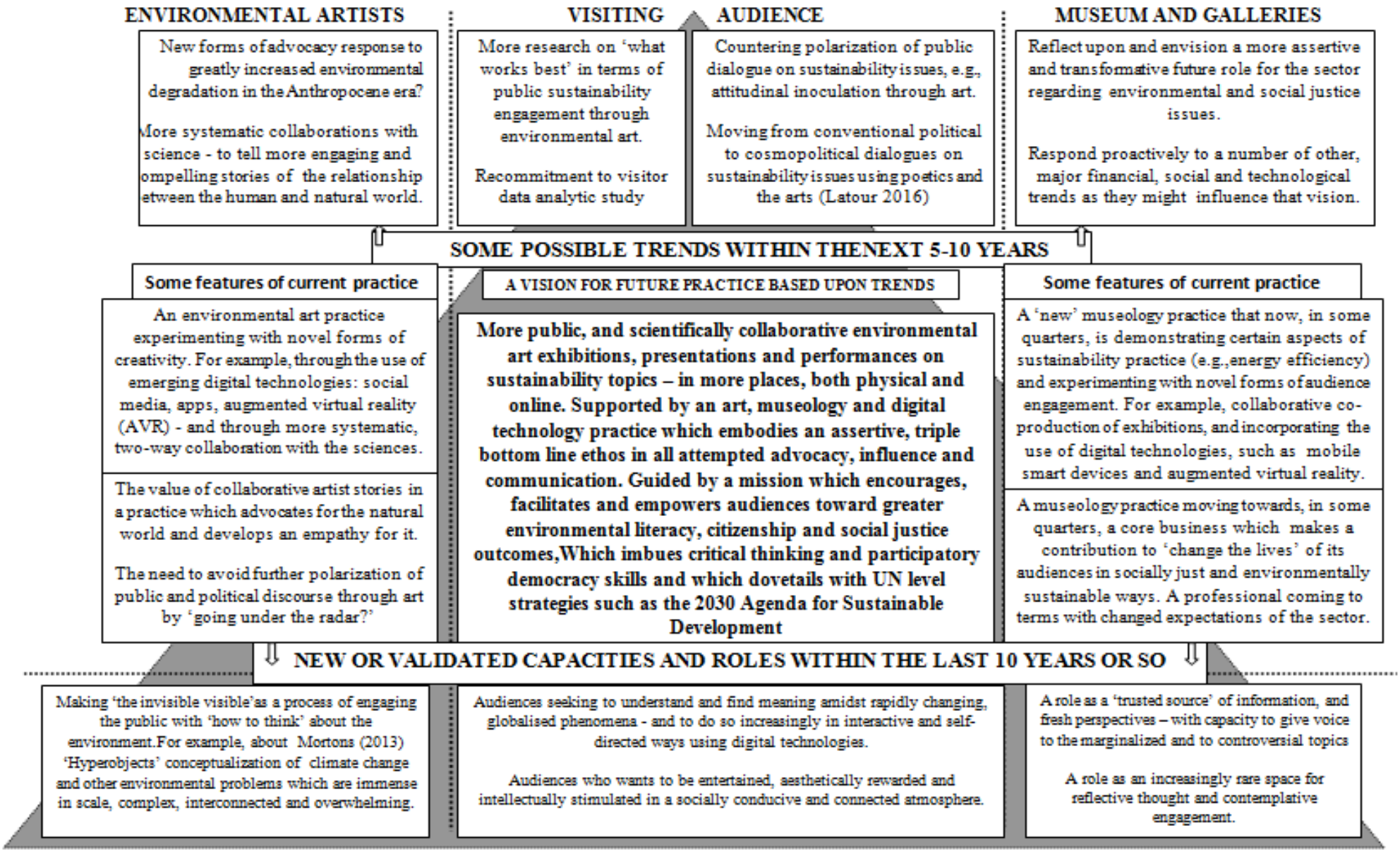
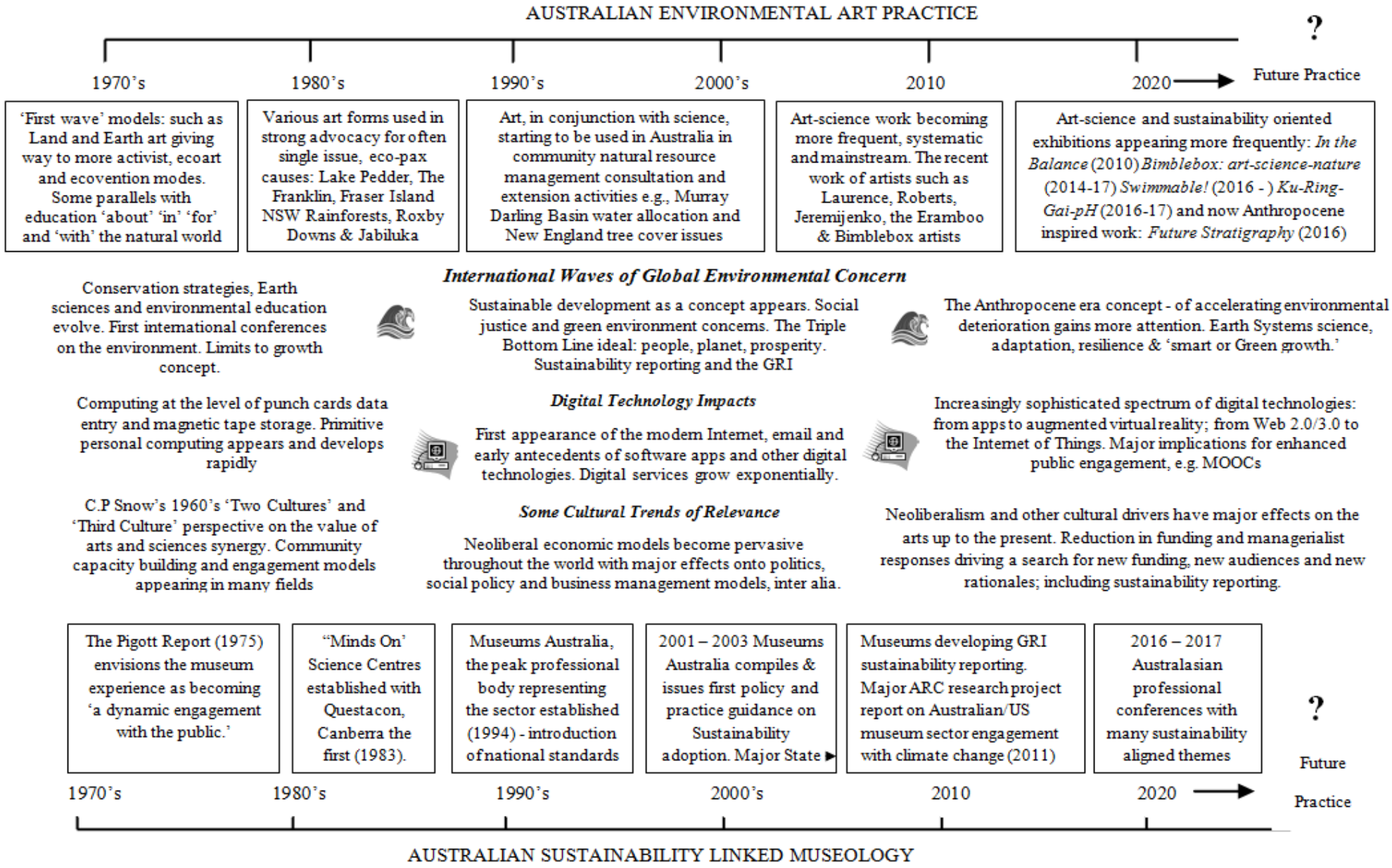


Figure 2: SOME ENVIRONMENTAL ART, MUSEOLOGY AND CULTURAL TRENDS TIMELINES 1970'S – PRESENT DAY



APPENDIX C:

Table C1: *Semi-structured interview questions for final survey point of artist and museum population cohorts*

For Bimblebox exhibition contributing artists
Question 1: In relation to your own work, practice or employing organisation. What is your initial response to any of the issues covered in the resource essay or summary of key points, concerning the future intersection of environmental art the Australian museum and gallery TBL sector sustainability adoption and digital technology presentation of art?
Question 2: In terms of your professional relationship with the museum, gallery or other public venue that does or might show your work **-** Would there be any opportunity to get this venue to present more environmental art to the public – either from you or other artists? What is it about this venue that has been most encouraging and supportive of your environmental work; and least encouraging/supportive? PROMPTS: In your view does the venue have capacity to engage more assertively with its community of interest in terms of environmental art advocacy presentation? For example, in holding public education workshops, forums or seminars? What would need to happen to make these possibilities more likely, and what are the factors that make it less likely?
Question 3: What is your interest or capacity to engage in more environmental art-science collaborative projects? PROMPTS: Again, what would need to happen regarding your practice to make this possibility more likely, and what are the factors that make it less likely for you?
Question 4: In terms of the use of digital technology in your work – is this a significant enabler of your practice, or does it serve a minority role – or frankly is it a constraint on your work? PROMPTS: For example, do you/don't you host your own website, use social media or use another digital resource in creating or presenting your work? If so, why, and if not, why not?
Question 5: Does your local museum or gallery venue use digital technology effectively for art presentation purposes, in your view? PROMPTS: Could more be done in this regard and if so – how? What would be needed to enhance the situation?
Question 6: Finally, are there any questions missing from this list – things you think should have been asked but were not – or do you have any final comments to make on any of these topics regarding your art practice?

APPENDIX C:

Table C1: *Semi-structured interview questions for final survey point of artist and museum population cohorts.*

For Bimblebox museum and gallery staff
Question 1: In relation to your own work, practice or employing organisation. What is your initial response to any of the issues covered in the summary of key points or resource essay, concerning the possible future for Australian museum and gallery TBL sector sustainability adoption? How are these points relevant (or not) to your professional niche?
Question 2: In terms of your employing organisation or professional role, what is your view on the future presentation of environmental artwork? Is there any opportunity to get more environmental art presented, and in ways that could enhance the public sustainability education and engagement of your venue visitors? If so, what are the factors supporting this? If not, what are the factors constraining it?
Question 3: What about the future role of the digital technology spectrum in terms of presenting more environmental art in more engaging ways within your organisation - be it Web 2.0, social media, apps, or augmented virtual reality?
Question 4: Looking back over the last couple of years, how do you think your museum, gallery or role has made the greatest difference to individuals, communities, society or the environment?
Question 5: Over the next few years, could your museum, gallery or role build on that achievement, and use venue reputation and resources to make a greater impact? What do you foresee as the particular opportunities or constraints acting upon your role or venue that are likely to make this more or less likely to happen?
Question 6: Finally, are there any questions missing from this list – things you think should have been asked but were not – or do you have any final comments to make on any of these topics regarding your art practice?

APPENDIX D:

Table D1: *Comparison of pro-environmental behaviours in the Bimblebox population and a New South Wales representative population*

Activity	% of Bimblebox survey sample n=79	% of NSW 'Who Cares' survey 2012 n=2002	Difference
	Often + Sometimes	Often + Sometimes	
Decided to re-use something rather than throw it away	90%	79%	11%
Avoided plastic bags to carry shopping home	85%	68%	17%
Composted food and/or garden refuse or used worm farm	75%	48%	27%
Chosen household products better for the environment	80%	75%	5%
Reduced water consumption	90%	83%	7%
Reduced home energy consumption	85%	94%	- 9%
Reduced fuel consumption/ vehicle air pollution	75%	69%	6%

Note. Bimblebox exhibition research data were collated from responses to question 6.1 in Survey Part A which asked about research participant performance of 14 environmentally supportive behaviours. These results were then compared to similar findings from a longitudinal survey of the environmental attitudes and behaviour conducted on a population of over 2000 residents of New South Wales in 2012.The 'Who Cares about the Environment' longitudinal survey has been run intermittently in that state since the mid-1990s, and questions relatively large samples of residents for their response across a wide range of environmental issues (NSW Government, 2017).

Table D2: *Worldview comparison between Bimblebox research and CSIRO study 2010 - 2014*

Worldview selected	Frequency		Percentage	
	Bimblebox	CSIRO	Bimblebox	CSIRO
1: Environment is fragile	51	2193	88	42.5
2: Environment managed sustainably	5	1232	8.0	23.9
3: Change, innovation and technology	0	726	0.0	14.1
4: Environment unpredictable	2	1012	4.0	19.6

Note. In Survey Part A, question 7.1 asked research participants to choose one preferred Worldview statement reflecting their environmental perceptions. The full statements from which participants were asked to choose were: The environment is fragile and will only be protected if there are large changes in human behaviour and society. The environment can be managed by the government and experts if there are clear rules about what is allowed. The environment can adapt to changes, and technology will solve environmental problems eventually. The environment is unpredictable and we can't control what happens. Total research population Bimblebox n= 58: CSIRO: n= 5163.

APPENDIX D

Table D3: *Comparison of participant PEB scores and Worldview*

Worldview	Green PEB profile			Brown PEB profile		
	Baseline	+ 6 months	+12 months	Baseline	+ 6 months	+12 months
1: Environment is fragile (88% of baseline population)	45 (78%)	52 (78%)	31 (66%)	6 (10%)	8 (11%)	5 (11%)
2: Environment managed sustainably (8 % of baseline population)	3 (5%)	6 (9%)	7 (15%)	2 (3%)		1 (2%)
3: Change, innovation and technology (0 % of baseline population)		1 (1%)	1 (2%)			2 (4%)
4: Environment is unpredictable (4 % of baseline population)	1 (2%)			1 (2%)		

Note: sample population numbers. At baseline n= 58, at + 6 months n= 67, and at +12 months n= 47

APPENDIX D:

Thematic report on engagement issues for a cohort of Australian environmental art and museum practitioners

The following comments represent a researcher summary and paraphrasing of verbatim comments given by a group (n=10) of Bimblebox exhibition contributing artists and exhibition venue curators as their contribution to the third and final round of participant interviews conducted in September to October 2017

Themes from the Curator Cohort (October 2017)

Sustainability engagement and the future relevancy of the museum and gallery sector A strengthened art, museum and technology intersection is a good idea in principle, but some informants thought that there was a more important immediate issue. If it is to stay relevant it is incumbent upon the whole museum and gallery sector to get on with the challenges of achieving greater outreach to its audiences. These were being addressed in the vanguard of the Australian sector, for example in terms of social inclusion via greater representation of indigenous art; and encouraging families and young children to visit museum venues and to be able to feel relaxed and comfortable within them.

Some venues were exploring the opportunities offered by the limited government project funding available, through programs such as 'Flying Arts.' An objective was to use such resources to help spread the message that the arts have a valuable role to play in creating a sustainable, prosperous community with high levels of wellbeing. In the process this was also making the case for the increased relevancy and value of museum and gallery spaces as both a community arts hub resource and a gathering space for education, entertainment and cultural expression; particularly in the regions.

Sustainability engagement in larger and smaller sector venues
There was a view expressed by some informants that larger museum institutions seem to going for an entertainment blockbuster and visitors-through-the-door-preoccupation at present. It was felt that this was not an effective model for public, triple bottom line sustainability engagement. In fact, sustainability adoption initiatives seemed to be more prominent in smaller institutions at present. This perspective seemed to be borne out by the scope and range of the exhibitions, programs and community outreach initiatives of the small regional museum and gallery venues that exhibited the Bimblebox exhibition and which were included in the present research.

There was the potential for a greater divide to open up between larger, relatively better resourced metropolitan centres and smaller, less well-resourced regional ones. Nonetheless, some informants were optimistic that the trends for the presentation of environmental art connected to both Green and wider social issues was gaining a lot of current interest within Australian museums and galleries. The level of public sustainability engagement a museum and gallery venue achieves in relation to its communities of interest is not all about financial resourcing anyway, but is connected, significantly, to the dynamism and pro-environmental orientation of its curatorial and organizational culture.

Sustainability engagement and the traditional educational role of the museum Informants thought that a key way a museum could fulfil a public engagement role on sustainability remained within its longstanding and traditional educational functions. But the educational leverage that is achievable by the museum and gallery sector as regards sustainability adoption is connected to the much larger change and reform required within the conventional educational sector itself. To some extent this issue is being considered through a renewed focus at the UN level on education for sustainability and an interest to get that educational model into more schools and other educational institutions.

Green museum practice and concern for the environmental footprint of the museum sector overall

Some informants thought that museums, and to some extent linked galleries would ultimately follow the lead of their major funders, which in most cases was still local government and other government bodies. As these institutors were wrestling with sustainable development adoption themselves, it followed that, museums and galleries would follow suit. It is important that the funding mechanisms for the museum sector in Australia, and elsewhere, and the commissioning of more environmental art needs to reflect and incorporate sustainability principles from the outset. Otherwise the art and museum sector may just come to represent another growth model for its own sake. For example, it was said that there are 5,000 new museums projected to be built in China, and the sector is expanding rapidly there. But what is the environmental footprint for that physical infrastructure in China? Is such expansion sustainable in an ecological sense? And could the sector physical infrastructure growth issue also resonate with the expanding digital technology debate? Perhaps the latter could go some way to mitigating the effects of the former - for example by encouraging more interaction with digital as opposed to physical visitors?

There is also the possibility now of virtual museums without walls – this idea has been around for a long time in embryo but is increasingly becoming more of a reality with the latest Web 2.0,3.0, MOOC and augmented reality digital applications. There is already a very solid online presence and range of services offered by some contemporary museums. Should /could this trend be accelerated? For example, to counter physical visitor environmental impact pressures generated by visitor travel, consumption and waste production.

The use of digital technology in art presentation for sustainability engagement

Digital technology can be a twin-edged sword and its use for the presentation of environmental art needs to be approached with some caution, so that it stays an adjunct and facilitator to the art, rather than an end in itself. On the issue of digitization of collections, the process had the capacity to allow objects and artwork to be accessed by larger audiences; and shared more straightforwardly between GLAM institutions in the regions. However, the process also required considerable human resources, although some venues were finding ways to achieve good levels of digitization at relatively low cost through the use of volunteers.

One benefit from both venue-based and online digital technology adoption came from help with the issue of maintaining variety in the physical exhibitions mounted by smaller rural and non-metropolitan venues; where a physical audience can be quite small. On the other hand, digital presentation of art online could run counter to such objectives because it was usually free to access; and in a cash-strapped regional community people might think twice before visiting a museum or gallery – particularly if they could experience some aspects of the place at home.

The effects of a 'more from less' financial environment
Several informants thought that the capacity to institute useful changes regarding Green museum and gallery sustainability adoption and public engagement had to be considered against a backdrop of doing more with less, and major reduced funding streams to the museum sector across the board. Cuts were already making significant inroads into professional staffing and forcing some venues to be ever more reliant on volunteers. On the other hand, financial cuts were leading to the museum sector making a virtue of necessity; for example, pushing smaller, regional institutions toward amalgamation and greater inter-venue partnership. One informant thought that for some professionals in the sector there was value in expanding a triple bottom line conception of sustainability adoption to include 'culture' as a fourth pillar of adoption. This would give greater visibility to ecological sustainability concepts as linked to a cultural guardianship role that the sector already well understands and responds to.

Themes from the Artist Cohort

The art must come first in any consideration of public engagement.
Informants thought that the idea of an enhanced art, museum and technology intersection, using new trends in art-science collaboration and emerging digital technology to present environmental art was good in principle. A clear proviso, however, was that the art must come first in any considerations; and it would be probably be useful if new public sustainability engagement initiatives using art in such a way should be tied to quality and proven community capacity building frameworks, such as citizen science.

The public education value of art-science collaboration – and potential pitfalls
Some informants thought that art-science collaboration was definitely a valuable public educational tool that is well respected and popular with the public. On the other hand, there is a potential for trivialising and 'dumbing down' the visitor experience of art through over- zealous application of technology which can sometimes interfere with artistic creativity and authenticity, and reduce aesthetic experience. One way to foster a higher quality of environmental art and science creativity is through greater artistic collaboration with the scientific staff of local museums or other science research institutions.

The use of digital technology in art presentation for sustainability engagement
There needs to be a clear recognition of the difference between original art creativity and its subsequent digital representation. The authenticity of the original art object needs to be remembered and incorporated into the digital process in some way. On the other hand, there are some artists in the vanguard of becoming 'digital natives' and working almost exclusively with some of the newer technologies, such as 3-D animation and augmented virtual reality.
The Australian artist Lynette Walworth was cited as an example in this regard. Equally, there is a current high cost of entry in producing technology generated art – perhaps as high as
$20,000 per exhibit from one informant estimate.

Whilst the digital technologies that were emerging offered a great future resource to use in conjunction with environmental art – there was also the possibility that a number of digital divides might open up as well. For example, between the younger 'digital natives' who had grown up with screen technology and the older generation (including some artists) who were still adjusting. There was also a potential divide emerging in resourcing of digital technology use between larger, relatively better resourced metropolitan centres and smaller, less well-resourced regional ones. This seemed just another facet of the metropolitan/regional divide in operation. Notwithstanding such concerns, there is definitely a digital zeitgeist and increased interest in the use of digital technologies

by artists – for example, as applied to artwork which allows interaction by the public. The high level of audience interactivity possible within an art exhibition such as 'People Like Us' touring nationally in Australia until 2019, is a demonstration of this trend.

The relationship between artists and the museum and gallery sector

Some informants thought that there were considerable challenges ahead in fostering a greater interaction between the museum sector and environmental artists. For some individuals there was little faith that the museum sector in Australia is up to the task of greater public outreach and achieving more ambitious social impact. Another factor was the extent of vested interests underpinning museum venue funding. When venue financial support is highly aligned with mining or extractive industry interests there can be a caution and constraint on artistic creativity and sensitivity to 'biting the hand that feeds you.'

Informants also thought that good quality art can still win through in such circumstances - and carry even a controversial environmental message without necessarily being rejected. The quality of the professional relationship between artists and museum curatorial staff could be key in getting more environmental art into venues. Some informants thought it was a joint responsibility for both the artist community and the museum and gallery sector to make this happen. More artists with nascent environmental art advocacy projects could be approaching museum and gallery venues, as well as scientists – in order to garner more generic exhibition and environmental art-science collaborative work. And more museums could be seeking to promote and commission an interest in environmental art initiatives.

Working with communities of interest

Some informants thought that putting a future emphasis on art that was connected to the environment would be best served by artists linking to communities of interest or professional associations which have sustainability principles as a key focus. These could include organizations that might not be immediately thought of as being in the sustainability 'tent.' An example cited was the Earth Laws Alliance with its focus on ethical valuation for the natural world; and Earth and other species jurisprudence and legal protection. Getting involved with environmental and ecological sustainability communities of interest was one of the best ways for artists to meet like-minded individuals, scientists and other potential collaborators who might eventually help in the commission, production and presentation of environment and sustainability oriented art.

Countering the cultural lack of respect for artistic creativity in Australia

Some informants thought there was a comparative lack of cultural respect for the role that artists play in Australia, for example in comparison to Europe. Whilst Australian audiences did appreciate some of the more commercial levels of artistic creativity, they seemed rather naive about the level of apprenticeship and experimentation that all artists need to undergo before they reach the peak of their creativity. There is a simplistic notion that good quality art literally just appears ready formed more or less out of thin air. This undervaluation can act as a brake on artistic motivation. On the other hand, informants also thought that there was a need for caution when putting a 'value' on environmental art, even in the service of public sustainability engagement. This concern linked to what had happened with the economic valuation of nature in the form of the ecosystem services concept. This sort of valuation can backfire and it can in fact be counterproductive to try and put a conventional monetary figure on something like the natural world, or on art practice, which possesses considerable intangible value – beyond purely dollars and cents.

APPENDIX D

Table D5: *A priori and emergent language codes taken from 20 hours of participant Survey Part B interview transcripts (n=20)*

Code Description	Corresponding element within the postulated models
A PRIORI LANGUAGE CODES– developed from Klöckner (2013) and Curtis, et al (2014)	**C = from Curtis et al (2014) and K = from Klöckner (2013)**
Comments which demonstrate research participant (RP) awareness of environmental consequences as elicited by the artworks **(AC) 22** ***(2)***	The influential effect of awareness of environmental consequences provided by information communication C/K
Comments which related to an RP's ascription of personal responsibility in relation to artwork themes depicted **(APR) 5** ***(9)***	Ascription of personal responsibility to an environmental issue C/K
Comments which related to an RP's recognition of environmental information communicated to them and their possible reflection upon it **(CI) 31** ***(1)***	Information: communication, developing awareness of consequences and outcomes C
Comments which related to an RP's sense of empathy for the natural environment as influenced by the artworks **(ENE) 12** ***(5)***	The role that empathy for the natural world plays in a sense of place and pro-environmental behaviour C
Comments which related to RP's description of a piece of environmentally supportive behaviour at least in part associated with experience of exhibition artworks **(ESB) 4** ***(10)***	A conscious recognition of individual environmental behaviour resulting from artwork influence C
Comments which relate to an RP's awareness of the force of personal habit as it may influence their pro-environmental behavior in positive or negative ways **(HAB) 4** ***(10)***	The important influence played by habitual behaviours in personal environmental response C/K
Comments linked to an RP's intention to act in an environmentally supportive way **(ITA) 8** ***(7)***	Intention to act as a major precursor of pro-environmental behaviour in most environmental psychology models C/K
Comments which related to an RP's identification with a particular Worldview **(NEP) 6** ***(8)***	The potential influence of the Worldview belief systems explored in this research K
Comments which related to a perceived sense of personal RP agency or behavioural control in relation to artwork environmental themes **(PBC) 11** ***(6)***	Degree of personal agency or locus of control as another key precursor of intention to act/actual behaviour C/K
Comments which related to an ecological (self-concept) expressed by an RP in which environmental conservation themes figured prominently **(SC) 14** ***(4)***	Environmental self-concept here taken as being closely related to personal norms which are also a predictor of ESB C/K
Comments relating to (situational enablers or constraints influencing the behaviour of RP's (e.g., lack of money, time, specialist knowledge, excessive distance to travel or stress) **(SIT) 14** ***(4)***	These could be either positive or negative (e.g., availability of money, or time, or distance to travel
Comments which related to a pro-environmental influence on RP's through their admiration of the personal/social environmental norms held by the exhibition artists **(SN) 20 (***3***)**	Social norm influence is cited as a precursor of actual behaviour in most environmental psychology models C/K

Comments which demonstrate an RP expression of values, beliefs, attitudes connected to experience of the exhibition **(VBE) 6** ***(8)***	Values, beliefs and attitudes are present as factors in both models. C/K
EMERGENT LANGAUAGE CODES AND THEMES	**Categories and themes additional to those derived directly from the theoretical models**
Comments relating to the opportunity for art which generates potentially confronting environmental messages palatable to a diverse audience and which avoids prescription, polarization or adversarial debate **(1 POL) 17** ***(5)***	**POL:** the psychological constraints that operate around polarized or emotionally charged issues such as human induced climate change and fossil fuel mining. **Emergent Themes:** the challenge to art advocacy in remaining influential whilst avoiding being drawn into polarized and adversarial debate. A sense of personal agency in audiences developed by appeals to both the specific and common good, and through the positive, activist role model provided by artists themselves. The value of fostering critical thinking about the environment and providing a reflective public space for that to evolve
Comments relating to the opportunity for art that can foster widespread, practical and assertive community and political action and solutions to environmental problems – **(2 POL) 12** ***(8)***	
Comments relating to the value of environmental art and artists to be seen as credible and trusted sources of information about the environment + or – **(3 POL) 5** ***(14)***	
Comments relating to the value of art that helps unite people in a common environ mental cause with possible additional social, and wellbeing benefits **(4 POL) 19** ***(4)***	
Comments relating to the strategic value of art appealing to targeted segments of a generic audience as opposed to a mass appeal – **(5 POL) 12** ***(8)***	
Comments relating to the value of reflective or meditative space in museums and galleries or online to foster critical thinking through experience and interpretation of artworks **(6 POL) 6** ***(13)***	
Comments relating to the negative effect of a lack of a shared narrative, social connection or expressed emotion in environment or scientific communication activity **7 POL-** code withdrawn	
Comments relating to the capacity of one environment themed project to catalyse others and build community capacity towards public engagement with sustainability issues **(8 POL) 3** ***(16)***	
Emergent codes and themes	**Categories and themes additional to those derived directly from the theoretical models**
Comments relating to the power of serendipitous or unanticipated experience of environmental art – and as a possible way to avoid anticipated negative reactions **(1 PSY) 1** ***(17)***	**PSY: the psychosocial factors** operating at emotional or sub-conscious levels which can mediate the influence of environmental art on behaviour **Emergent themes:** a widespread understanding of the way in which art can influence thought process and behaviour through emotion either, positively through beauty or joy or negatively through shock, anger or sadness.
Comments relating to the potential of emotional response to aesthetic beauty to 'cut through' and facilitate reception of an unpalatable message **(2 PSY) 3** ***(16)***	
Comments relating to the power of serendipitous or unanticipated experience of environmental art – and as a possible way to avoid anticipated negative reactions **(3 PSY) 7** ***(12)***	
Comments relating to the power of art to communicate through emotion – either negatively, for example through shock or fear; or equally positively through humour, aesthetic beauty and joy in experience **(4 PSY) 25** ***(2)***	

Comments relating to a paralysis or reticence of action emanating from fear of powerful vested interests or being overwhelmed by the magnitude of environmental destruction **(5 PSY) 7** ***(12)***	
Comments relating to the desire to see more environmental art of a similar nature based upon the present experience of the research participant with the Bimblebox exhibition **(6 PSY) 3** ***(16)***	
Emergent codes and themes	**Categories and themes additional to those derived directly from the theoretical models**
Comments relating to the power of art imagery to reinvoke/reinforce existing, habituated, pro-environmental thought patterns or to bring back ESB to front of mind. **(1 GMI) 20** ***(3)***	**GMI : the general mechanisms** by which environmental art influence my work on audiences
Comments relating to a recognition of cumulative experience of art on intention to act in an environmentally supportive way **(2 GMI) 3** ***(16)***	**Emergent themes:** The way in which environmental art imagery may additionally prime or visually 'frame' sustainability concepts that audiences already possess in some form The positive reception given to a mobile software application to present artworks in a compelling and engaging way. The wider implication of this response for the future use of digital technologies to engage the public with sustainability issues through environmental art The contribution that art imagery can make to building an environmental stewardship ethos anchored to developing a stronger sense of place and the existence value of other species
Comments relating to the beneficial public engagement effects of digital art-enabling or disseminating technologies such as software apps – as opposed to text resources e.g. text catalogues ,or conventional media **(3 GMI) 19** ***(4)***	
Comments relating to the different but useful and complimentary type of engagement experience that a 'digital representation of artworks' can provide **(4 GMI) 13** ***(7)***	
Comments relating to the challenge of maintaining a balance between direct personal experience of art and digital technology representation **(5 GMI) 4** ***(15)***	
Comments relating to the negative effect of mechanical, electronic, or digital technology distraction on experience of artworks **(6 GMI) 10** ***(9)***	
Comments relating to artistic creativity - the communicative power of a positive future vision, story or prescription with embodied expression of emotion **(7 GMI) 8** ***(11)***	
Comments relating to the value of using art to create a place story with multiple perspectives **(8 GMI) 12** ***(8)***	
Comments relating to the communicative value of having diversity of artistic responses within an exhibition **(9 GMI) 6** ***(13)***	
Comments relating to a lack of experience in the use of art for environmental advocacy purposes **(10 GMI) 7** ***(12)***	
Comments relating to the particular mutual benefits of systematic collaboration between the arts and the sciences as well as the advantage conferred for public communication of environmental issues **(11 GMI) 1** ***(17)***	

Comments relating to a perceived failure of the artworks to communicate in a sufficiently powerful or compelling enough way **(12 GMI) 4** ***(15)***	
Comments relating to the efficacy of environmental communication of the artworks being related in some ways to the extent of prior knowledge or understanding that an audience member possesses – linking to a visual framing and priming concepts of influence **(13 GMI) 8** ***(11)***	
Emergent codes and themes	**Categories and themes additional to those derived directly from the theoretical models**
Comments relating to the 'multi-sensory value' of experiencing a physical art exhibition as opposed to a representation of one simply through imagery **(1 AIA) 10** ***(9)***	**AIA: themes related to the audience interaction with environmental art** in terms of the way it is created presented and interpreted **Emergent themes:** Finding the best balance between experiential and didactic audience experience of art to achieve the greatest engagement impact. Ensuring that art is as openly promoted and accessible to as wide a circle of the public as possible to overcome any tendency for it to be considered elitist.
Comments relating to communicative purposes – finding the best synergy between static or interactive experience of the art, understanding its meaning through didactic explanation, and through the additional facilitation artists, curators or educators can provide **(2 AIA) 26** ***(1)***	
Comments relating to overcoming any inability to make sense of the meaning of an artwork - for example - if the audience is not open minded to the experience or believes it is beyond them **(4 AIA) 14** ***(6)***	
Comments relating to the value of a diverse presentation of art forms to influence a wide cross sectional audience **(5 AIA) 6** ***(13)***	
Comments relating to the preference for one type of art over another in terms of representation of the environment e.g. mimetic/representative versus abstract /conceptual **(6 AIA) 9** ***(10)***	

Note. For a priori codes in the left column the value in black following a 3-letter descriptor is the number of times that respective code was identified in separate transcriptions of participant interviews. The figure in puce is the rank order of the code which is also aligned with the theoretical model element from which it was derived – given in the right column. For the emergent codes in the table the descriptions in the left column were derived from the same participant transcripts as were a priori codes and using the qualitative methods described in thesis section 3.3. Again, the numbers in black and puce represent the number of times a code was identified from transcripts and its rank order, respectively. The right column contains some generic categories and themes aggregated from the emergent codes. Interview transcription continued up to the point at which no new emergent codes were identifiable. This resulted in 20 transcriptions being used in total.

APPENDIX E:

Research participant comments regarding Bimblebox exhibition influence on pro-environmental motivation, intention or behaviour 2016-2017

In Survey Part A Question 6.2 asked participants to make comments about any future environmental activity or intentions they might have after having interacted with or seen the Bimblebox exhibition. A selection of 47 verbatim comments which answered the question in the affirmative is given below. The comments were taken from surveys conducted at baseline, 6 month and 12-month intervals (A1-A3) and the approximate date of interview follows in each case.

Survey Part A Question 6.2: *Please make comments about any future environmental activity/intentions you may have at this time after having interacted with or seen the Bimblebox exhibition.*

A1 04 2016
More politics, more talking with people, more interaction and building consciousness of how our exploitative political-economic system is at the root of both world-wide poverty and environmental degradation.

A1 01 2017
I would really like to be more involved particularly in rural areas through which I travel with my work. I grew up watching the devastation of clearing land. I believe that symbolism is very useful when capturing thoughts and opinions. However, the more subtle the message the harder it is to reach the masses.

A1 05 2016
Continue to use my art practice to hold a mirror up to human indifference to the natural World.

A106 2016
Visit Bimblebox, one day I hope.

A1 06 2016
Make more effort to not use plastic bags when buying food. Look again into solar energy storage and usage. Attend Landcare working bees.

A1 04 2017
In my environmental activist projects, I will be giving serious thought to the role of artists in communicating about environmental issues and solutions and I will send invitations to potential contributors who are visual artists, performers, poets, musicians, and so on.

A1 12 2016
Write more letters to politicians.

A1 02 2017
Heading to Bimblebox if destruction begins.

A1 02 2017
Will have the intention to know more about the mining activity impacts to environment in Australia.

A1 06 2016
It has also made me feel more aware of what/how/if I teach about looking after our environment to my students and how I (and they) might be able to improve my (our) overall environmental impact.

A1 08 2016
The exhibition made me think about being more publicly/externally engaged with environmental campaigns -- e.g. taking part in local conservation or donating to organisations that are fighting for environmental causes.

A1 04 2016
Going completely solar powered.

A2 03 2017
Will be attending more political marches...and be more vocal about opposition to continual. use of fossil fuels in Australia.

A2 05 2017
It has added resolve to existing environmental intentions such as getting solar electric.

A2 03 2017
Using the art works as ekphrastic stimulus for creating poetry.

A2 08 2017
I think I did say in an earlier survey that at the time I first saw the art - yes it did increase my interest in being actively involved with environmental conservation after quite a long absence away from it.

A2 03 2017
Since the exhibition I have actively pursued other information about making change, e.g. bought a book about ways to reduce our impact on the environment and implemented a number of the suggestions Become vegan, worked hard to reduce food waste, buying mostly organic food, trying to prioritise food with low food miles. Become a much more discerning consumer - not buying new if possible finding products made from recycled materials or where production creates some social good. Looking for minimal packaging

A2 03 2017
I have become active in online petitions and sending letters to politicians via environmental organisations websites. Have joined Facebook and share these on Facebook. Installing new home solar hot water system.

A2 03 2016
Opposing the Adani coal mine through whichever means I come across. Being more aware of the environmental impacts on the Great Barrier Reef which we always thought would be protected forever.

A**2 03 2017**
Installing solar power to my residential home. Investing in a compost bin and/or lobbying for household compost bin collection through local council. Reducing my consumption

A2 02 2017
Having my own interactive, immersive exhibition that uses different forms of human- powered intervention to reveal hidden connections within our ecosystem whilst simultaneously reinforcing the fact that we too form part of this interconnected sphere of life within the Biosphere.

A2 ART 06 2017
Continue strategy at my museum for passive and renewable solutions for energy needs. Develop interpretation of museum collections that supports transition out of coal economy in coal mining regions.

A2 03 2017
Sharing information with friends and family regarding the environment and their place in it and duty towards it. I especially try to influence my younger relatives.

A2 11 2016
I'll continue to attempt to rub people's noses in it.

A2 05 2017
I decided to get more actively involved in opposing the Galilee Basin developments through donations of money and participation in letter writing and online campaigns.

A2 03 2017
Joined professional learning group at place of work to work on embedding sustainable living in the curriculum and identify what could be improved around campus to reduce energy costs and make our campus more sustainable.

A2 03 2017
Increase our composting to 2 bins.

A2 05 2017
I intend to keep informed about the effects of coal mining and related industries on the food bowl productive areas in our region and on the Great Barrier Reef.

A2 05 2017
The Bimblebox exhibition made me a little bit more aware of where the power that I use actually comes from and at what cost. I do have future intentions to reduce my personal energy use.

A3 08 2017
I do think my original viewing of the Bimblebox art helped catalyse or perhaps refresh something in me so far as coal mining and its destruction is concerned. I do even now recall some of the artwork images I saw in the exhibition - for example 'Coalface.' So, there must be a link for me.

A3 08 2017
I think that my experience of the Bimblebox art helped strengthen a sense of collective compassion in me - as it revealed the energies and commitments of other people to conserve and protect important parts of our threatened planet. I suppose art is a real source of strength and inspiration for me as I go about my own battles to help save the environment. It is a real source of comfort and motivation to see, through the art, that other people are prepared to do the same.

A3 09 2017
I will continue to involve other artists in my main environmental interest at present which is supporting the transition to a new economic framework in Australia.

A3 08 2017
Currently I am looking at doing a community survey in the "nature search" manner. This involves onsite non-invasive surveys on private land. Seeing the Bimblebox exhibition reminded me of the nature search programme which just records what is there at the time, but does not have a conservation programme to back it up. I have also been thinking a bit about the current exposure of the myth of recycling glass (most it seems goes into land fill).Glass is a fantastic medium so I have been thinking how glass could be used in community art.

A3 08 2017
Since first looking at the Bimblebox artworks in their catalogue I have seen other environmental art - for example in a physical exhibition near to my home. The art in that particular exhibition was linking industrial smokestack emissions to the melting of icebergs in the Antarctic. This again reminded me of the power of art to bring up environmental concerns for me and reinforce them in my mind. As with the Bimblebox art I am thinking that this must be a step towards making it more likely that I will carry out more stuff in the future
- if I am prompted/reminded like this by certain artwork. On the other hand, there will also be things that prevent my best intentions - such as lack of money!

A3 09 2017
I definitely think that the Bimblebox exhibition has had a strong influence on my art practice. What I mean is that I am now more conscious of focusing on environmental themes within my art - for example around the subject of trees and their value. The Bimblebox exhibition process and the artist involvement have also inspired me to think of ways I might be able to get such an art project happening locally here.

A3 08 2017
I think that looking at the Bimblebox artworks definitely reinforced my existing commitment to the environment by strengthening my resolve to continue with my existing activites.This effect came mostly from my gut level reaction to the art. I did read the information panels about the artist stories - but at the end of the day it was the power of certain art pieces I remember. The coalman figure, for example, and that white ghost like figure in the outback landscape.

A3 08 2017
I intend to keep on talking about the experience of viewing this artwork and being involved in this research has had on me, as well as the influence that the story of the artists and their commitment in bringing these problems and issues to attention have also had on me.

A3 09 2017
I can definitely trace an effect of the Bimblebox exhibition onto my environmental attitudes. That artwork which had the blanket and food bowls affected me emotionally and strongly. It moved be to tears to be frank. For me it represented the stupid destructive things we are doing to nature - through coal mining or anything else - and for what? All this rubbish and all this damage for very little achievement - it is all wrong. The blanket artwork brought a lot of that anger and negative feeling up for me. It made me more determined to fight this nonsense in whatever way I can.

A3 09 2017
I know I have become more aware of wanting to reduce my consumption. For instance, I don't buy so much clothing as I used to - even though I could if I wanted to. But honestly, whilst I don't think that sort of a decision is solely down to having seen the Bimblebox exhibition - it might have made my determination a bit stronger on that subject though - it's hard to say really.

A3 09 2017
I think one of the influences of the Bimblebox exhibition - it has shifted my environmental interest slightly beyond my existing interest in local, home based environmental issues to further afield. The impacts of coal mining are a good example of that.

A3 09 2017
Thinking about it, a couple of things come to mind. I have taken more interest in the revegetation of mine sites and mined areas since seeing the Bimblebox art. I do think that was a direct effect of seeing the exhibition and being reminded of the damage that coal
mining does to a place. The images spiked my interest. Also, I have now joined the GOMA organisation because of an increased interest in indigenous art - and again I lay that directly down to having seen that indigenous piece of art in the Bimblebox exhibition.

A3 08 2017
Due to Bimblebox I would say I have definitely tuned into more programs and information in relation to the Adani Coal Mine - basically because it is part of the Galilee Basin region which also contains the Bimblebox Refuge - and one of the artworks – Jill Sampson's food bowels - clearly depicted that connection. I would also say that I have had a little bit more strengthening of my existing thinking about coal mining and its negative impacts closer to my home here.

A3 08 2017
I'd say much the same as when I was last interviewed. I will look out for more environmental art and the opportunity to be informed about the environment through art in addition to my usual ways. I think that the Bimblebox art was important to me in helping focus and re- energise my interest in environmental matters. It is often possible to feel isolated on environmental matters - and the exhibition helped remind and inspire me about the importance of working toward conservation of natural places. Yes, overall the exhibition had an important impact on me.

A3 08 2017
I have also been thinking a bit about the current exposure of the myth of recycling glass (most it seems goes into land fill).Glass is a fantastic medium so I have been thinking how glass could be used in community art. This idea was probably not begun by the Bimblebox

photos, but directed by it. I may not have thought of using glass for a community art project, particularly about involving the community etc if I had not seen the exhibition. If I had this idea without the exhibition I might have only thought WHAT can I do with this, not how can I use it?

A3 09 2017
I think that the artworks of the exhibition were definitely beneficial and made me think more about certain things I am doing that could have some impact on the environment. I have started giving my grandchildren recycled paper on which to draw instead of new stuff. That has been a direct result of thinking about the destruction of trees which came across to me in the exhibition. It has also made me more aware of the need to recycle more paper and cardboard into the recycling bin.

A3 08 2017
Seeing the Bimblebox art definitely increased my awareness and concern about the impacts of coal mining in Queensland and although I have not done anything practically about this yet
- I might well consider going on some protests or workshops along the lines of Stop Adani if that came up in my area in the future.

A3 09 2017
To continue to support the environment. For example, in terms of coal mining issues that were raised in the Bimblebox exhibition. If possible, I intend to travel to any protest that goes ahead against the Adani Coal mine in northern Queensland.